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ILLUSTRATIONS

OF THE

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ZYGŒNIDÆ & BOMBYCIDÆ

OF

NORTH AMERICA,

BY

RICHARD H. STRETCH.

VOL. I. PART I.

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PREFACE.

The object of the present work is to furnish in a compact form, good colored illustrations of all the species of *Zygœnidæ* and *Bombycidæ* found in North America, north of the Mexican boundary; with accompanying letter press, in which it is intended to embody everything of interest in relation to each species, which may have appeared in print, with such additional information as I may be able to secure from original sources. There is nothing at present which covers this ground. Many species are unfigured, others have been figured only in black and white; the illustrations being at the same time scattered through many works. In relation to the letter press, the latter remark is equally true. The synopsis of the Lepedoptera of North America, by Morris, with appendix, by Clemens, while a valuable work, is much behind our present knowledge of the groups; and it is moreover unaccompanied by plates, without which the determination of the species of some genera, such as *Arctia*, is nearly impossible. It is hoped the present effort will supply a want which I have myself seriously felt in studying these groups, and which I doubt not, must have been equally patent to the rapidly increasing number of entomologists in the United States.

Many species exist in cabinets only as unique specimens; and a large number are so rare that few possess them. The difficulty of procuring these for the purpose of figuring them, will preclude the possibility of commencing at the head of the list and figuring the species seriatim, in natural sequence, so that the insect will be figured as I can procure them, precedence being given to those that are new or but little known, an effort being made however to present all the species of a genus in the same number, where it is possible to do so. In the letter press it will be my endeavor to make the synonymy and history of each species as complete as possible, using the original descriptions where they are sufficiently accurate, and adding thereto the characters of the larvæ and their transformations where known.

The work will probably extend to about thirty parts, which it is intended to issue at intervals of about six weeks, in octavo size, uniform

with the "Transactions of the American Entomological Society," of Philadelphia, each part to contain one plate colored, with the appropriate letter press, and no pains will be spared to make the plates very superior. As the letter press will partake very much of the character of a compilation, I desire to acknowledge the valuable labors of my predecessors in this field, and to return my sincere thanks to those who have promised me their assistance, and in the appropriate place it will be my pleasure to credit each individual with his respective work.

RICHARD H. STRETCH.

San Francisco, June 1st, 1872.

ZYGŒNIDÆ AND BOMBYCIDÆ

OF

NORTH AMERICA.

Genus, **ALYPIA**, Hübner.

"Head small; front long, pilose, the scales surrounding the conical projection of the clypeus, but not concealing its apex. Antennæ long, a little thickened in the middle with scattered lateral setæ. Clypeus square, the front margin very obtusely rotund-pointed. First and second joint of the palpi stout, pilose; third joint long slender; the whole palpus porrect, the third joint passing beyond the front of the head.

"Thorax more than usually pilose, especially the pro-thorax and patagia. Wings short and broad. The primaries are one-half as broad as they are long, being broadly triangular. The nervules are rather short, and arise at a greater angle with the main nervures than in *Eudryas*. Secondaries rounded, triangular, the outer margin full, rounded at the apex, and also at the internal angle.

"The legs have the first pair of femora and tibiæ densely spreading pilose, and stretched out in front of the body, as in some Notodontians. The hind pair of legs are large and long, with stout tibiæ armed with two unequal pairs of spines, of which the terminal pair is the shorter.

"In coloration the species are black moths with large white and yellow rounded patches upon both pairs of wings. * * *

Packard, Proc. Ess. Inst. April, 1864.

The following is a tabulation of the species found in the United States and Canada, to which countries the genus appears to be confined.

a. Maculations all yellow.

* Posterior wings with 1 spot.

† Anterior wings with 2 spots. *A. Sacramenti.*

Anterior wings with 3 spots. *A. Grotei.*

* Posterior wings with 2 spots.

† Anterior wings with 2 spots. *A. dipsaci.*

† Anterior wings with 3 spots.
Outer spot irregular. *A. Ridingsii.*
Outer spot broadly ovate. *A. Similis.*
Outer spot sub-linear. *A. Lorquinii.*
* Posterior wings with 3 or more spots.
† Anterior wings with 3 spots. *A. lunata.*
† Anterior wings with 4 spots. *A. Mariposa.*
b. Maculations of anterior wings yellow, posterior white.
* Posterior wings with 1 spot. *A. Langtonii.*
* Posterior wings with 2 spots.
† Anterior wings with 2 spots. *A. Octomaculata.*
† Anterior wings with 3 spots. *A. Maccullochii.*
c. Maculations all white. *A. Brannani.*

1.—ALYPIA OCTOMACULATA. (Pl. 1., fig. 7. ♂)

Zygæna octomaculata, Fab. (1793).
Figured in Sm. Abb., Pl. 44, Vol. 1 p. 87. (1797).
Alypia quadriguttalis, Hübn., Ver. p. 351. (1816).
Alypia octomaculata, Hübn., Zutr. 22, fig. 119. (1818).
Alypia octomaculata, Harris, Sphing. 34. (1839).
Alypia octomaculata, Morris, Syn. Lep. N. Am., p. 132. (1862).
Agarista octomaculata, Boisd., Am. Soc. Ent. Bel. Vol. 12, p. 68. (1869).

♂ . ♀ .—Head black, hairy ; sides of the front with a few long yellow hairs. Antennæ slender, black, slightly thickened in the middle. Palpi black, hairy, the basal joint covered with yellow hairs, and a few shorter ones at the base of the terminal article. Prothorax hairy, black, yellow beneath, at each side, and very slightly so in the centre above. Patagia sulphur yellow. Abdomen above and below black, with an indistinct white dorsal line. Legs black, with orange colored scales on the tibiæ of the middle and anterior pairs.

Wings deep velvety black, fringes concolorous. Anterior wings with two large sulphur yellow spots, the basal one longitudinal and more or less sub-quadrate. The apical one over the nervules, transverse, varying in shape from ovate to pyriform. Posterior wings with two white spots, the basal one large and sub-triangular, the apical one much reduced, ovate and placed slightly beyond the middle. Beneath as above.

Expanse of wings, 1.30 inches. *Length of body*, 0.55 inch.

Habitat.—Northern Atlantic States, (Coll. generally.) California. (Coll. Boisduval).

This well known species is abundant in the Northern Atlantic States, and Boisduval states that he has received the pupæ from California. The larva feeds on the grape; the imago appears in the latter part of May. The following notes on the larva and its habits are extracted from "Harris's Entomological Correspondence," page 285.

Larva.—"Very young specimens not more than three-tenths of an inch long, were destitute of the black transverse lines found in older specimens; they were whitish, tinged with dull orange red on the middle of each segment, and with numerous, irregular, brownish, transverse lines between. The dorsal series of tubercles, particularly on the fourth, fifth, sixth and eleventh segments were very prominent, acuminated and brownish black; the others were brown as were also the feet. The head and top of the first and last rings were very pale red, and the dots were obsolete or invisible on these parts. The side of the eleventh segment was distinctly marked with a white, irregularly shaped spot. The hairs on the tubercles were distinct, but colorless. As the larvæ become older and larger, their colors become more intense and with stronger contrasts. The pale orange bands become deep orange; the transverse brownish lines and the tubercles become deep black; the head, etc., become darker colored, and the black dots upon it are visible to the naked eye."

Full grown larva. "The full grown larva have a decided blueish tinge, entirely owing, however, to an optical phenomenon from the contrast of the white with the transverse black lines. The head is of pale dirty orange or rusty yellow with about eight black dots on each side; a semi-circular plate on top of the first segment and the anal valves are pale orange dotted with black. There is a transverse series of black dots on the second and third segments, without any orange band. Each of the other segments is transversely banded with orange and dotted with black, the dots being in two alternate rows, and all of them emitting distinct, long whitish hairs. Between each of the bands there are six slender, continuous, black, transverse lines. The points are also connected by interrupted black lines. Legs at base, orange, black externally and at tip, except the anal pair which are orange dotted with black. The large, white, lateral spot is common to the side of the tenth and eleventh segments. The other lateral white spots are situated immediately behind the bands on the fourth, fifth, sixth, seventh, eighth and ninth segments, the anterior spots being largest;

and thence they diminish to the ninth, while again the posterior spot is very large, and very distinct. The orange bands are interrupted on the top of the seventh, eighth and ninth segments."

Pupa.—The larva enters the ground to undergo its transformation, constructing an earthy cocoon, no silk being used in its construction, and only sometimes a little gummy secretion. The larva is full fed about the middle of July.

2.—ALYPIA BRANNANI, N. S. (Pl. 1. fig. 8, ♂.)

♂.—Head, black, hairy; sides of the front with a few long yellow hairs. Antennæ, slender, black, slightly thickened in the middle. Palpi, hairy, black, with a few long yellow hairs on the basal joint, and a few shorter ones at the base of the terminal article. Prothorax, hairy, black, with a few yellow hairs in the centre, and the sides and beneath of the same color. Patagia, clear sulphur yellow. Abdomen, above and below, black, with an indistinct whitish dorsal line. Anal tuft, black. Legs, black, with orange colored scales on the tibiæ of the middle and anterior pairs.

Wings, deep black, with fringes of the same color. Anterior wings with the costa swollen at the base, making the costa distinctly concave beyond the middle, much more so than in A. octomaculata. The markings consist of two *white* spots; the basal one being subquadrate, the terminal one lying across the nervules, slightly reduced, transverse and ovate. Posterior wings with two white spots, the basal one moderate, rounded, divided by the black median vein; the other beyond the middle, reduced and sub-ovate. Beneath as above, except that the spots are somewhat larger, the margins being clouded, and less clearly defined than in A. octomaculata. This is especially the case with the basal spot on the primaries.

Expanse of wings, 1.30 inches. *Length of body*, 0.55 inch.

Habitat.—California. (Coll. H. Edwards).

This insect was taken by S. Brannan, Jun., near Cisco, on the Sierra Nevada Mountains, at an elevation of about 6,000 feet, in July, on the flowers of various composite plants.

While strongly resembling A. octomaculata in the style of markings, it is easily separated from that species not only by the difference of color, but by the structure of the costa of the fore wings, which resembles that of the males of A. Lorquinii and A. Similis.

3.—ALYPIA DIPSACI, (Pl. 1, Fig. 1).

Alypia dipsaci, Grote, Trans. Am. Ent. Soc., Vol. 1, p. 236. (Plate 6, fig. 36, ♀.) (1868).

Agarista dipsaci, Boisd., Am. Soc. Ent. Belq., Vol. 12, p. 68, (1868–9).

"♀.—Resembles Alypia octomaculata. Black. Head, black; labial palpi well extended beyond the front, black, roughly scaled; eyes very narrowly margined with pale sulphur yellow scales before the antennal insertions, and more prominently and continuously so beneath. Patagia, pale sulphur yellow, fringed with black hairs. Abdomen, entirely black, or blackish. Legs, black; anterior and middle tibiæ clothed with orange colored scales; on the anterior tibiæ the scales are thicker and more prominent, and do not extend over the lower extremity of the joint; on the middle tibiæ the orange scales are shorter, forming a lateral tuft, and include a black dot near the lower extremity of the joint; the middle femora are faintly shaded with orange inwardly. All the tarsi are marked with whitish, the basal joints most distinctly. Antennæ, long, gradually thickening toward the tips, black, narrowly sub-annulate with white over their slender basal portion."

"Wings, black, with a faint reflection. Primaries, with two large sulphur yellow spots; the first towards the base, smaller, sub-triangulate; the second over the nervules, larger, sub-pyriform, oblique. Secondaries, with a reduced, basal, sulphur yellow spot, and an outer, much larger sub-quadrate patch. Beneath, the markings of the upper surface are exactly repeated, while the yellow of the spots is paler. The fringes of both wings, on either surface, are entirely black and silky."

Grote, Trans, Am. Ent. Soc., Vol. 1. p. 326.

Expanse of wings, ♀. 1.10 inches. *Length of body*, ♀. 0.55 inch.

Habitat.—California. (Coll. H. Edwards and R. H. Stretch).

This species is readily distinguishable from A. octomaculata by its smaller size, and the different color and proportion of the spots on the secondaries. The specimen in my collection was taken by Mr. Lorquin, who furnished Boisduval with the specimens from which his description and that of Grote, quoted above, were drawn. The exact locality in which they were taken has not been preserved, though it was probably in the foot-hills of the Sierra Nevadas. Dr. Boisduval states that Mr. Lorquin has raised the larvæ on a species of *Dipsacus*

of which he does not know the specific name, and that pupæ forwarded to him from California by the same gentleman, were disclosed in Paris in the following May.

4.—ALYPIA SACRAMENTI, (Pl. 1, fig. 2).

Alypia Sacramenti, Grote, Trans. Am. Ent. Soc., Vol. 1, p. 327. (Plate 6, fig. 38, ♀.) (1868).

Agarista Sacramenti, Boisd., Ann. Soc. Ent. Belq., Vol. 12, p. 69. (1868–9).

"♀.—Size, large. Black. Head, black; labial palpi well extended beyond the point, black; inwardly touched with pale sulphur yellow scales. Antennæ, long, black, thickened toward the apices. Eyes, narrowly margined on the front, before the antennal insertion, with pale sulphur yellow, and more prominently and continuously so beneath. Legs, black, anterior and middle tibiæ clothed with orange colored hair. Thorax, black; the patagia and sides of the prothorax are sulphur yellow, the former fringed with black hairs. Abdomen, entirely black.

"Wings, ample black. Primaries, with two sub-equal sulphur yellow spots; the first towards the base, irregularly sub-quadrate, its upper margin being angulated; the second over the nervules, sub-ovate, oblique. Secondaries, with a single reduced sulphur yellow spot shading to whitish, situate beyond the discal cell. Underneath, the spots are paler, more irregularly shaped and notably larger; this latter character is especially to be perceived when the single spot of the secondaries is considered; it is here whitish and much larger, being externally produced, than its analogue on the upper surface."

Grote (loc. cit).

Expanse of wings, ♀. 1.30 inches. *Length of body*, ♀. 0.55 inch.

Habitat.—California. (Coll. H. Edwards and R. H. Stretch).

The present species sustain a similar relation to A. dipsaci, with that borne by A. Langtonii to A. Octomaculata. It is, however, larger than any of the allied species. From A. Dipsaci, it differs prominently by the single reduced spot of the secondaries; and from A. Grotei, Boisd., (a species which I have not yet seen,) in having only two instead of three spots on the primaries.

I am indebted, for this fine species, to my friend, Mr. Henry Edwards, of San Francisco, who took three specimens in July, 1870, in the neighborhood of Donner Lake, at an altitude of 6,000 feet above the sea, on the Sierra Nevada Mountains. Boisduval says

(loc. cit.) that it is found in the neighborhood of Sacramento, which being in a broad valley and nearly at the sea level, would indicate a wide range. Mr. Edwards describes the flight as peculiar, the insect after a flight of a few yards dropping suddenly among the herbage, and when captured simulating death in the net. This latter characteristic does not obtain with any of the other species found on this coast.

5.—ALYPIA RIDINGSII, (Pl. 1, fig. 3).

Alypia Ridingsii, Grote, Proc. Ent. Soc. Phil., Vol. 3, p. 521. (Plate 5, fig. 1, ♂.) (1864).

"♂.—Anterior wings, black, with a slight sub-cyaneous metallic tinge; apex, produced, rounded; costa, swollen at the base. A large, sub-triangular, very pale yellow spot on the median vein, beyond which is a small, rounded, similarly colored spot on the disc. In the terminal space, is a series of five paler, elongated spots, neatly separated by the black veins. Posterior wings, black; a single moderate, pale yellow, rounded discal spot, beyond which, in the terminal half of the wing, is a large, somewhat ovate, pale yellow spot, divided inferiorly twice by the black veins. Fringes on all the wings, black, except at the apices of the anterior wings, where they are marked with white; under surface, resembling upper. Head, palpi; orbits of the eyes, black; prothorax, whitish; tegulæ, thorax, abdomen and legs, black, with a blueish metallic tinge; middle tibiæ with bright orange tufts on their upper surface, not reaching the apex of the joint."

Grote (loc. cit.)

Expanse of wings, 1.30 inches. *Length of body*, 0.55 inch.

Habitat.—Colorado Territory. Mr. Ridings. (Coll. Ent. Soc. Phil.) California. (Coll. Edwards, Behr, Behrens, Stretch.) Nevada. (Coll. Eaves).

Resembles A. Maccullochii, from Canada, and A. Lorquinii and A. Similis, from California. Mr. Grote (loc. cit.) thus describes the difference between this species and A. Maccullochii: "The basal spot on the anterior wings is more triangular, not elongated outwardly, nor divided by a black line, the vein being covered with identically colored scales; the terminal band is broader, composed of five, instead of six spots; the 'whitish longitudinal one, of the under surface on the costal area,' is wanting; the spots on the posterior wings are quite different, there being but two spots in our species, the basal one small, rounded, undivided and differently placed; the 'costal streak is also wanting."

Judging from Kirby's figure, the costa of the anterior wings in our species is more excavated; apex, more produced and rounded; the tegulæ are black, not white, as are also the orbits of the eyes. Mr. Walker's description contradicts Kirby's in giving the middle tibiæ only orange tufts, a character I have given to the present species with some hesitation, the legs in the single specimen I have being imperfect, while Kirby describes A. Maccullochii as having orange tufts on anterior, and middle tibiæ like A. Octomaculta."

From A. Lorquinii and A. Similis it may be readily distinguished by the black patagia, and the shape of the outer spot on the primaries. In the two former species, this is ovate, or sub-linear, while in A. Ridingsii the spot increases in width from the costa towards the inner angle, where it is abruptly truncate; and its inner margin is irregularly concave, owing to the varying length of the segments of which it is composed.

Mr. Grote's description of the legs is correct, the middle pair only being ornamented with orange scales. The female from which my figure is drawn, differs in no wise from Mr. Grote's description and figure, except in the larger size of the discal dot on the anterior wings, a peculiarity also common to the females of A. Lorquinii and A. Similis. This species was named by Mr. Grote, after Mr. James Ridings, whose labors, in Colorado and elsewhere, have greatly added to our knowledge of North American Lepidoptera. The type was collected in Colorado Territory by Mr. Ridings; and its subsequent occurrence in the vicinity of San Francisco, California, and at Virginia City, Nevada, is interesting, as indicative of the wide range of many species west of the Rocky Mountains, not found to the eastward of that range. A. Lorquinii, and Coloradia Pandora, *Blake*, are other instances, and when the high Sierras of California have been thoroughly explored, we shall probably find a yet greater similarity in their faunas.

6.—ALYPIA LORQUINII (Pl. 1, Fig. 4.)

Alypia Lorquinii, Grote, Trans. Am. Ent. Soc. Vol. 1., p. 328. (Plate 6, Fig. 39, ♂.) (1868.)

Agarista Lorquinii, Boisd., Ann. Soc. Ent. Belq. Vol. 12, p. 69. (1868–9.)

"♂.—Allied to the Canadian A. Maccullochii and to A. Ridingsii from Colorado Territory. Black. Head, black; eyes prominently margined behind with sulphur yellow; labial palpi roughly scaled, black, prominently exceeding the front; maxillæ blackish; antennæ

black, terminally enlarged, neatly and closely sub-annulate with white along their basal portion. Thorax black; tegulæ sulphur yellow, fringed with black hairs; abdomen, black, with two approximate, dorsal, sulphur yellow dots at the base; legs, mostly closely scaled, blackish; anterior and middle tibiæ, fulvous; the middle femora are also somewhat touched with fulvous inwardly.

"Wings, black, somewhat lustrous. Anterior wings, with the costa swollen, and slightly convex, centrally owing to the enlargement of interspace above sub-costal nervure. Veins, marked by lustrous scales. At base, a large, sulphur yellow patch, obliquely margined outwardly, and straightly inferiorly, neatly divided by the black median nervure into dissimilar portions. A rounded spot on the disc, and a transverse, sulphur yellow, narrow, elongate-oval spot beyond the disc, neatly divided four times by the black nervules. Secondaries, with a large, whitish spot at base, the black median nervure separating a small portion inferiorly. Beyond the discal cell, an elongate, narrow, whitish spot, much as on primaries (but reversed, tapering inferiorly), and divided three times by the black nervules. Fringes on both wings, black and lustrous. On both wings beneath, the ornamentation of the upper wings is reproduced; the spots are very pale yellow; on the secondaries the extra discal spot has lost its inferior dot, is broader and prolonged above sub-costal nervure towards the base of the wing."

Grote (loc. cit.)

Expanse of wings, ♂, 1.00 inch. *Length of body*, ♂ 0.47 inch.

Habitat.—California, (Coll. Edwards, Behr, and Stretch.) Colorado Territory, (Coll. Edwards).

Mr. Grote says (loc. cit.): "Compared with three ♂ specimens of A. Maccullochii, agreeing with Kirby's figure, contained in the British Museum Collection, and so determined in the B. M. Lists, the present species differs by the sub-terminal band, which is divided into spots by the black nervules, being much narrower on either wing, and coming to a point superiorly on the primaries. The discal spot of the primaries is smaller in A. Maccullochii than in A. Lorquinii, and on the under surface the basal patch is larger. On the upper surface of the secondaries, the sub-terminal band is composed of five spots in Kirby's species, while, in A. Lorquinii, where it tapers inferiorly, it contains but four. On the under surface, the white basal patch in Kirby's species is more extended, and the sub-terminal band receives one or two accessory spots, inferiorly. Finally, the maculations of the secondaries are white in A. Maccullochii, and pale yellow in A. Lorquinii."

The precise locality in which the specimens were taken, which Mr. Lorquin forwarded to Dr. Boisduval, and from which the descriptions of Boisduval and Grote were drawn up, has not been preserved. Boisduval states that he received the chrysalis from Mr. Lorquin, and that they were disclosed in Paris, but does not know the plant on which the larvæ fed. Mr. Henry Edwards took one specimen in July, near Yosemite Valley, California, at an altitude of nearly 8,000 feet; and I have seen one specimen captured by T. Mead, Esq., in Colorado Territory, on the Rocky Mountains. It seems probable that, as we become better acquainted with this genus, the species will be found to have a very wide geographical range.

7.—ALYPIA SIMILIS, (Pl. 1, fig. 5, ♀.) N. S.

♂.—Black. Head black. Eyes, prominently margined behind and beneath with pale sulphur yellow. Palpi, black, roughly scaled, projecting prominently beyond the front. Antennæ, long, black, gradually thickened towards the tips, sub-annulate with white on the basal portion. Thorax, black; two minute pale yellow spots on the prothorax; patagia, pale sulphur yellow. Abdomen, black, with a minute basal yellow dot above, Legs, black; tibiæ of middle and anterior pairs, clothed with pale orange scales; tips of the joints of the tarsi whitish.

Wings, velvety black, with faint metallic blue reflections. Anterior wings; with the costa swollen, and convex centrally, owing to the enlargement of the interspace above the sub-costal nervure, the central portion of the enlargement being nearly destitute of scales and subdiaphanous. At base, a large triangular sulphur yellow patch, much produced towards the inner angle, and faintly divided into two unequal portions by the median nervure; a minute yellow discal spot; and an outer transverse, sulphur yellow, broadly-ovate band, neatly divided by the black nervules into *six* spots. The posterior wings have a moderate, pale sulphur yellow, triangular, basal patch, unequally divided by the black median vein; and an outer, transverse, sulphur yellow band, broad on the costa and tapering to a point inferiorly, neatly divided by the black nervules into five unequal spots. Costal margin, yellowish from the base to the outer band. Beneath, as above, except that the costal streak on the secondaries is more strongly marked. Fringes on all the wings, long, black, and silky.

Four males correspond exactly with the above description, the only female I possess (from which the figure is drawn,) differs merely in

the larger size of the discal spot on the primaries, the absence of enlargement on the costa, and in having *seven* spots to the outer band on the primaries.

Expanse of wings, ♂ 1.20 inches, ♀ 1.30 inches. *Length of body*, ♂. 0.50 inch, ♀. 0.55 inch.

Habitat.—California. (Coll. Edwards, Behr and Stretch).

Resembles A. Maccullochii and A. Lorquinii. From the former it differs in having all the maculations pale, sulphur yellow, those on the secondaries of A. Maccullochii being white, according to Kirby. From A. Lorquinii it may be readily distinguished by the larger size of the terminal band on all the wings, which all have one more spot than in A. Lorquinii, and by the larger proportion of yellow in the coloration.

This species has a wide range in the coast counties of California, north of San Francisco, appearing to prefer the mountain regions. The enlargement of the costa in the males, which occurs also in A. Lorquinii, finds its counterpart in the allied Australian genus Hecatesia, where this feature is yet more strongly marked. My friend, Mr. Henry Edwards, whose enthusiastic labors have added so greatly to our knowledge of California Entomology, first called my attention to this similarity of structure, as also to the similarity of the clicking noise made by the males of both these insects, when in pursuit of the female; a noise probably produced in some way by the drum-like expansion of the costa. The imago occurs in May and June; has a very strong, rapid, irregular flight, and is exceedingly difficult to capture, as it is found chiefly on the mountain sides.

8.—ALYPIA LUNATA, (Pl. 1, fig. 6, ♀.) N. S.

♀.—Brownish black. Head, black. Eyes, palpi and antennæ, black. Antennæ, moderately long, very slightly thickened. Collar, pale sulphur yellow. Thorax, patagia, and abdomen, entirely black. Legs, entirely black, the tibiæ of the middle pair alone being ornamented with orange colored scales.

Anterior wings, full, strongly rounded at the inner angle, with the costa slightly concave, and much angulated at the base, making the head perceptibly less prominent. A reduced, pale sulphur yellow, triangular spot at the base. A moderate, quadrate, discal spot of the same color, and an outer, transverse, pale sulphur yellow band, very deeply emarginate internally, giving it the appearance of two pyriform spots united by their smaller extremities. Posterior wings, with a

slight indication of a discal dot, and an outer transverse row of three pale yellow spots, the inner one large and sub-orbicular, the two outer, small and faint, and more or less connected with powdery yellow scales. Beneath, as above, except that the discal spot on the secondaries is more distinct. Fringes, long and black, except at the apices of all the wings, where they are white. All the wings show a few scattered yellow scales.

Expanse of wings, ♀ . 1.65 inches. *Length of body*, ♀ . 0.65 inch.

Habitat.—California. (Coll. Edwards, Behrens and Stretch).

Allied to A. mariposa, Grote, (Trans. Ent. Soc., Vol. 1.) if it be not a variety of the same species. It differs from Grote's species (loc. cit.) in the following particulars: In wanting the yellow orbits to the eyes; in having the collar yellow instead of black; in having orange colored tufts on the tibiæ of the middle pair of legs; and in the union of the two outer spots on the primaries into one lunate spot, with the extremities of the crescent, club-shaped. Three specimens agree with the above description so closely, that although the difference between this species and A. Mariposa are slight, they appear to be constant. The large elongate wings of this species, separate it widely from all the other species of this genus, except A. Mariposa, and perhaps A. Grotei, Boisd. The latter insect is yet unknown to me.

Genus, **PSYCHOMORPHA**, Harris.

"Body, slender, hairy at the tip. Palpi, slender, nearly horizontal, extending a little beyond the clypeus, covered with loose hairs so as to conceal the joints. Tongue, moderate, spirally rolled. Antennæ in the male pectinated on both sides, the pectinations rather short, simple in the female. Wings, short, somewhat triangular, with the outer margins rounded; discal areolet of the hind wings short, closed by a sinuous vein. Abdomen, not extending beyond the hind wings. Legs, short, hairy; spurs of the hind tibiæ, three, slender, nearly concealed by the hairs."

Doubleday, in his letters to Dr. Harris, (Harris. Ent. Corr., 1869, pp. 130, and 137,) expresses his belief that this genus ought to be placed near *Brephos* among the noctuæ, stating on the authority of Abbot, that although the larva has the full compliment of legs, it seems to be a semilooper in its walk. Dr. Harris seems to have been of the same opinion. The neuration of the wings appears, to me, to entitle it to the present position to which it has been assigned by Grote and Robinson, in their catalogue of the North American species of these groups.

1.—**PSYCHOMORPHA EPIMENIS**, (Pl, 1, fig. 16).

Noctua epimenis, Drury, App. III. Exot. Ins. III, 39, pl. 29, fig. 2. (1773).

Psychomorpha epimenis, Harris.

Glaucopis epimenis, Morris, Syn. Lep. N. Am., p. 136. (1862.)

Psychomorpha epimenis, Clem., Syn. Lep. N. Am. App., p. 297. (1862).

Brown. Head, thorax, and abdomen, with all their appendages, black. Anterior wings, rich brown, sprinkled with light, metallic blue scales, which form a narrow band close to, and parallel with, the outer margin, and marked with a large, ovate, transverse, whitish yellow patch beyond the middle of the wing. The spot touches the costa, but does not reach to the inner margin, and is notched on the inner side above the median vein. Posterior wings, deep brown, with a large, dark, orange red patch, occupying nearly the entire outer half of the wing, scarcely touching the outer margin, and tapering rapidly to the anal angle.

Beneath, as above; except that there are dark, metallic blue scales on the costa of the posterior wings, and none on the anterior wings,

except a few along the costa. On the anterior wings, there is also a small, triangular, pale yellow spot at the base, between the sub-costal and median veins, and a smaller, transverse, quadrate spot of the same color, which unites behind with the angular projection of the large patch.

Expanse of wings, 1.00 inch. *Length of body*, 0.40 inch.

Habitat.—Atlantic and Southern States. The specimen figured was taken at Waco, Texas.

"The larva," according to Abbot, "feeeds on *Bignonia radicans*, and is pale, with black lines."

Doubleday. (Harris, Ent. Corr., p. 130).

Genus **SCEPSIS** Walker.

"The head is larger in proportion to the rest of the body than in Ctenucha, since it is a little broader than the prothorax, while in Ctenucha it is not as broad. The vertex is not so thickly scaled ; the front edge of the clypeus is broader and straighter, thus making the whole clypeus square; as long as broad, since the sides do not narrow so much as usual towards the front edge. Upon removing the scales, the occiput and epicranium are, together, equal in length to the clypeus. The occiput is transversely oblong, and divided by a mesial impression into two halves, considerably shorter than broad. The epicranium is subtrapezoidal, narrowing rapidly in front, and bilobed anteriorly by a deep, mesial impression. The two ocelli are situated not on either of the pieces, but just below the antennæ, and at each side of the suture, between the two above mentioned pieces. The clypeus is a little longer than broad. At its base, it is obtusely angular between the antennæ ; its sides narrowing slightly towards the front edge, which is nearly square. On the basal half of the piece, is a narrow ridge. Mandibles, very slender, directed outwards, with long, fine, dense bristles. Labrum, small, equilaterally triangular. Maxillæ, well developed, reaching, when unrolled, beyond the base of the abdomen.

"Antennæ, like those of Ctenucha, but with longer and more hairy pectinations. In the females, the pectinations are shorter ; clavate, ending in setæ, which are more apparent than in Ctenucha. Palpi, ascending, acute and slender, reaching beyond the front by a distance equal to that between the bases of the antennæ. Thorax, rather slender, a little longer than broad. The scutal pieces of the pro-thorax are united closely along the medial suture, each half not being so separate or so orbicular as in Ctenucha. The patagia are narrow, not reaching to the end of the meso-scutellum. Owing to the thin scanty squamation, the form of the tergal pieces of the thorax can be very distinctly seen; the meso-scutellum is hardly as long as broad, and is very obtusely pointed behind. It is much narrower and longer than in Ctenucha; so, also, the meta-scutellum, which is rounded behind, and very slightly produced into a slight obtuse angle.

" Primaries, three times as long as broad, being long and narrow. Costa, straight to the outer third, where it is curved slowly around to the somewhat produced apex. Outer margin, one-half as long as the inner; very oblique.

" The costal nervure terminates at the outer third of the wing, and runs very close throughout its length to the edge of the wing. First

subcostal arises very near the upper discal; second subcostal arises a little beyond the middle of the first subcostal; third subcostal is short, and arises a little beyond the middle of the distance between the apex of the wing and the origin of the upper discal nervule. The fourth subcostal branches off very near the apex, and is very short, being but one fourth as long as the fifth subcostal, which last arises at a less angle from its nervure than in Ctenucha. The discal nervures are much more curved inward than in Ctenucha. The median, beyond where it throws off its fourth median, is bent upward exactly parallel with the costa. Though longer, the nervules are thrown off much as in Ctenucha, but the distance between the origins of the third and fourth medians is proportionally greater than in Ctenucha.

"Secondaries not quite half as broad as they are long, being much produced towards the apex, and behind reaching to the basal third of the abdomen. Costa straight, convex near the base; apex acute; outer edge nearly three times as long as the inner; straight on the outer half of its length, but becoming a little convex toward the internal angle, which is well rounded; while the inner edge itself is straight. The subcostal goes remarkably straight to the apex, where its curves a little downward; it throws off a single straight nervule a little within the outer third of its length. The upper discal is a third longer than the lower, which is the stouter of the two. The three first medians are very short, one third as long as the whole median, the third shortest. First curved, second and third straight, fourth curved downward near its origin. The submedian is obsolete at its basal third, the terminal portion being more like a nervure than a mere fold. It is close to the internal and remote from the median. Internal straight, cutting off a large triangular area comprising the internal angle.

"Legs rather long, slender, thinly scaled, the spines minute and weak. The hind legs differ from Ctenucha in being much more slender, not at all swollen. There are the same proportions in the length of the joints.

"Abdomen broad, and acutely pointed at the tip in both sexes, with slight lateral tufts along the sides. The female tip is more obtuse than in the male, thus approaching female *Procris*, with its truncated tips, more than Ctenucha with its simple pointed tip. The genitals are simple, and concealed within the eighth ring of the abdomen.* There

* In this place A. S. Packard, jun., suggests that the genital apparatus afford excellent generic and specific characters in this family and probably in many others.

is apparent a tergal piece, and a sternal pair of short clavate appendages."

Packard. Notes on Fam. Zygœnidæ, Proc. Ess. Inst., 1864.

This genus is readily separated from *Ctenucha*, "by the curved palpi which are considerably shorter; the thicker clavate pectinations of the antennæ, the marked differences in the neuration, and the slender hind femora. The clypeus is much wider, and the mesial ridge is not so prominent or so long as in Ctenucha, the clypeus of which narrows much more rapidly towards the front edge." (Packard, loc. cit.)

1.—SCEPIS FULVICOLLIS, (Plate 1, fig. 9).

Glaucopis fulvicollis, Hübn.

Glaucopis semidiaphana, Harris, Cat. N. Am. Sphing. 38–4. (1839).

Scepsis fulvicollis, Walk., C. B. M. Lep.

Glaucopis semidiaphana, Morris, Syn. Lep. N. Am., p. 136. (1862).

Ctenucha fulvicollis, Clem. App. Syn. Lep. N. Am., p. 287. (1862).

Scepsis Packardii, Grote, Proc. Ent. Soc. Phil., Vol. 4, p. 308. (1865).

♂. ♀.—Head and antennæ, black. Palpi, black, with a few saffron colored hairs at the base. Prothorax, above and below, saffron colored. Thorax and patagia, blackish. Abdomen and legs, blueish black.

Anterior wings, smoky black, with the costa very narrowly edged with ochre, and the disc somewhat diaphanous. Posterior wings, blueish black around the margins, the remainder, hyaline.

Expanse of wings, 1.30 to 1.50 inches. *Length of body*, 0.50 to 0.55 inch.

Habitat.—Canada West, (Coll. S. H. Scudder). California, (Coll. Edwards, et als.). Illinois, Florida, [Doubleday in Harris' Ent. Corr. p. 122]. Colorado Territory, (Grote, Proc. Ent. Soc. Phil., Vol. 4, p. 308). Texas, (Belfrage).

This insect has a wide geographical range, as will be seen by the localities quoted above. It was formerly abundant on the site of San Francisco, but is no longer to be found in that locality. At Alameda, on the opposite shore of the bay of San Francisco (California), my friend, H. Edwards, found it in moderate abundance in August, frequenting the flowers of a species of *Solidago*. Doubleday, in a letter to Dr. Harris, (loc. cit.,) states that he took it in September, in Illinois, frequenting flowers belonging to the same genus; and what is remarkable, that it used to come to his lamps at night in Florida,

and that he does not remember to have taken a single specimen in that locality during the daytime. H. Edwards describes the flight as very strong, and much resembling that of the Sphingidæ.

S. Packardii, Grote, was in all probability described by Mr. Packard (notes on the Family Zygænidæ, p. 43, 1864) from specimens which had been captured several years, and lost the freshness of their coloration. On comparing specimens taken near San Francisco during the past year with others received from the Atlantic States, I am unable to detect the slightest difference, the blackish tint to the wings, and blueish abdomen being present in both. I have others taken some years back, which have acquired, some completely and others in a greater or less degree, the light brown tint to the wings, and the brown abdomen, spoken of by Mr. Packard as peculiar to the Californian specimens; and if these differences were specific, by far the larger number of the specimens I have received from the Eastern States, would have to be referred to *S. Packardii*, Grote. After a most careful examination, I am satisfied that there is no specific difference, and therefore give S. Packardii, *Grote*, as a synonym for the present species. The figure accompanying this description is drawn from a California specimen.

Genus, **CTENUCHA**, Kirby.

"In this genus the front of the head is as broad as the distance from the insertion of the antennæ to the front edge of the clypeus, being full and convex. Ocelli, large. Eyes, full and globose, of the usual size. When denuded the clypeus is seen to be short and scutellate, as long as broad, rising between the antennæ into a low obtuse point. In front it sweeps rapidly away from the eyes, rising from them, while the front edge contracts rapidly, the sides being slightly excavated just behind the square sub-truncate front edge, which seen from below is somewhat arched. On the surface is a slight mesial ridge extending and increasing in size to the base of the piece. The two pieces behind, viz: occiput and epicranium, are together in length equal to the clypeus, so that the antennæ are situated very exactly midway from the base to the front of the head. The "vertex" of the head is clothed with much longer scales than the frontal ones which project out between the antennæ. The occiput is regularly transversely oblong, being about four times as wide as long. The epicranium is narrow, sub-triangular, truncate in front; and at its base encroaches a little upon the occiput, than which it is one fourth longer. The triangular labrum is short, broad and obtusely pointed. Mandibles, slender, being nearly twice as long as broad, not very acute, with long setæ converging over the maxillæ which are well developed, and when unrolled reach to the base of the abdomen. The palpi are long and slender, of good size, porrect, somewhat flexuous in their course, curving downward at their base, and then rising a little, in front of the head, while their tips are a little depressed. First joint nearly as long as the second, with long depressed scales beneath, but generally the scales are fine. Second joint twice as long as broad, and with the third, which is a little shorter and acute, reaches out in front of the clypeus."

"Antennæ, half as long as the primaries, with long, finely scaled, pectinations, each of which bears a terminal setæ. In the female the pectinations equal in length that of the joints of the antennæ."

"Thorax, and body generally, stout and finely scaled. Patagia, large, free from the tergum beneath, reaching behind nearly to the posterior edge of the meso-scutellum, while its posterior scales reach to the base of the abdomen. The prothoracic scales are orbicular, large, and are unitedly broader than the head. Meso-scutum short, broader than long, scutellum large and pentangular, the longest side being the posterior edge, which is a little convex, and scarcely angulated in the

middle. Wings broad; the primaries a little less than half as broad as long. Costa full, convex towards the apex, which is rounded acute. Outer margin half as long as the costa, more than usually oblique. Inner edge two-thirds as long as the costa. The costal area is very narrow in this genus, since the subcostal runs very near the edge of the wing, and its first, second and third nervules are very long and parallel to the costal edge. Third subcostal simple, the fourth arises midway between the apex of the wing and the origin of the second subcostal. Fifth slightly removed towards the middle of the discal area, arising directly opposite the first and second median nervules, the origins of which are united, the second being straight, while the first and third are arched, the last one named arising very near the two first. They then enclose a very regular semioval area. Fourth median arises at a distance from the third equal to the length of the two discal nervules, which are straight, and unitedly are directed exactly at right angles to the costa.

"The secondaries are broadly triangular, reaching nearly to the tips. The costa is decidedly convex within its middle; the apex is produced, but very much rounded, as in the internal angle, though the inner edge is itself very straight, and is one-half as long as the costa. The lower discal nervule is directed obliquely outward, and both are curvilinear. The space between the first and third median is acutely triangular, since the nervules are nearly straight.

"The legs are long and slender, the hind tibiæ with two pairs of small acute unequal spurs, of which the inner pair are the smaller. Hind tarsi longer than the hind tibiæ, and the first tarsal joint is a little shorter than the three succeeding ones taken together. Abdomen, twice the length of the thorax, provided with minute lateral tufts, slowly tapering towards the tip, which is subacute, though not abruptly pointed."

Packard, Proc. Essex Inst., April, 1864.

The colors of the genus are bluish black or brown on the primaries, which are usually concolorous, but occasionally have the veins of a different hue, and deep blue black on the secondaries, with more or less vermillion or yellow on the head, collar and epaulettes. The general size of the insects is about two inches across the wings.

The following is a tabulation of the species found in the United States. The genus also extends to Mexico, New Granada and Chili.

a. Forewings black.
 * Abdomen unicolorous.
 Costa black - - - - 4. C. Ochroscapus.
 Costa white - - - - 3. C. Multifaria.
 * Abdomen bicolorous.
 Terminal 5 segments red - - 7. C. Robinsonii.
 Terminal 2 segments red - - 8. C. Harrisii.
b. Fore wings brown.
 Patagia black - - - - 1. C. Virginica.
 Patagia red - - - - - 5. C. Brunnea.
c. Fore wings veined.
 Veins white - - - - 2. C. Cressonana.
 Veins yellow - - - - 6. C. Venosa.

Of these species one (C. Virginica) is found only in the Atlantic States; one (C. Cressonana) is from the Rocky Mountains of Colorado Territory; one (C. Venosa) is found in Texas and Mexico, while the other five are from California, from which it would appear that the Pacific Coast may be considered the natural habitat of the genus. The species from the latter locality differ slightly from those of the more eastern States, the anterior wings among other things being somewhat narrower, but the differences are of such a character as scarcely to warrant their separation into another genus.

1.—CTENUCHA VIRGINICA, (Plate 1, Fig. 15. ♀.)

Sphinx? Virginica, Charpentier, Edit. Esp. Exot. Schm. Sphing. Exot. Plate 2, fig. 3 ♂, 4 ♀. (1830.)

Ctenucha Latreillana, Kirby, Faun. Bor. Am. iv, p. 305, 1. (428.) (1837.)

Glaucopis Latreillana, Harris, Cat. N. Am. Sphing. 39, 5. (1839.)

Ctenucha Latreillana, Walker, C. B. M. Het. p. 282.

Glaucopis Latreillana, Morris, Syn. Lep. N. Am. p. 136. (1862.)

Ctenucha Latreillana, Clem. App. Syn. Lep. N. Am., p. 285. (1862.)

♂.—Front black. Vertex and sides of head, orange. Palpi, orange, with the terminal article black. Antennæ, black, with very deep pectinations. Prothorax above, deep metallic blue. Prothorax below and

base of the patagia, orange. Rest of patagia, black. Thorax and abdomen, deep cyaneous, blacker below. Legs, black, with metallic blue reflections.

Anterior wings, smoky black or brown, with the fringes white, and slightly interrupted on middle of the outer margin. Posterior wings, deep blue black; fringes white, interrupted with black near the apex. Beneath, entirely deep sooty black.

♀.—Differs only in having antennæ with very short pectinations.

Expanse of wings: 1.90 inches. *Length of body:* 0.75 inch.

Habitat: Buffalo, N. Y., Canada, Eastern and Middle States (Grote.) Maine (Sanborn and Packard.)

This insect is reported as having been taken by Mr. Grote in damp woods near Buffalo, N. Y., and appears to be generally distributed over the Northern Atlantic States. Dr. Packard says of it: "I have taken the moth late in July, at Perry, Maine, and early in August at Brunswick. It flies in the hot sun, hovering over flowers, and is not difficult to capture, since its flight is not strong or rapid. In cloudy days it clings to the stems of plants, and can be easily taken with the hand."

Larva.—The larvæ, from which the following descriptions were drawn up by A. S. Packard, Jun., "were found June 6th, on the spears of grass, which grew in a sunny place upon a high neck of land running out into Casco Bay, Maine."

"The head is large, being nearly as wide as the prothoracic ring. The vertical region is largely developed and is considerably narrower above than in front. The epicranium is small, being nearly equilaterally triangular, the clypeus is narrower than the epicranium is long, and is raised, thickened, and its front edge distinctly convex. The labrum is short, and divided into two remote broad and short lobes. The mandibles are very broad, short, obtuse and thick. The labium and maxillæ can not very well be made out in my specimen, they are fleshy and with no determinate form for comparison."

"The body is short and rather thick, the rings moderately convex, and in consistence the skin is softer and more flexible than usual. On each side of the body are six rows of tubercles, the tergal ones much the largest. There are on each ring of the abdomen four large warts, arrayed in a broad trapezoid, becoming linear in position on the thoracic rings, and on the supra-anal plate. These tubercles give rise to dense fascicles of evenly cut hairs, which radiate out on every side so as nearly to conceal the body, and give it when viewed from

above a regular broad elliptical form, with very even sides. The eighth ring is not enlarged, but the body from that ring tapers posteriorly rather rapidly to the tip, though not by any means so much so as in Eudryas. The abdominal legs are short, thick and hairy, and the thoracic legs are still more bristly."

"The hairs on the upper part of the larvæ are collected into a mesial line of slight tufts. The head seen from above is concealed by dense over-arching hairs. True and false [abdominal] legs covered by lateral radiating hairs. The outline of the tergum is hardly tufted, but rather scolloped, the scollop on the third and twelfth rings of the body being most prominent, becoming short thick tufts. The hairs when magnified are seen to have long thick-set spinules."

"The specific characters are these: The body of the larva is purplish livid, covered with white and yellow hairs. Those hairs on the first two thoracic, and last two abdominal rings are all white. The head is a bright shiny red, black in front. There is a sub-dorsal and lateral row of bright yellow elongated spots, one for each ring, which are conspicuous through the hairs. Thoracic legs, black; abdominal legs, reddish, nearly concolorous with the head."

"A few specimens in the fourth [?] stage, i. e., that next to the last moulding, differed thus: They are more oblong in outline. Those hairs which in the full-fed larva were described as white, are here black. The mesial line of scollops here become actual tufts and black in color, of which the first and last are the longest. The hairs over-arching the head and tip of the abdomen are whitish gray. The colors of the body and the two rows of yellow spots are the same as in the mature larva."

Dr. Packard further states that the cocoon is composed entirely of the hairs from the body of the larva, which are held together by the minute spinules with which they are beset. "No silk is spun throughout the whole operation. I afterwards carefully examined portions of the cocoon under the microscope, and could detect no threads of any kind." From a larva which assumed the pupa state, June 17th, the imago was evolved July 15th. "The female laid smooth green spherical eggs in a patch, side by side upon the side of the vessel, which hatched out July 28th. The young larvæ were about twice the size of those of Orgyia when of the same age. They had large heads, and the body gradually decreased in size towards the opposite extremity. The hairs were sparse, long and rather uneven, much resembling young Orgyiæ. It will be seen that the larva lives twelve days in the

egg, about ten months as a larva, since there is but a single brood in the year, and they must hybernate when two thirds grown. It spends about twenty days in the pupa state, and but a few days as a moth."

2.—CTENUCHA CRESSONANA, (Plate 1, fig. 14, ♀.)

Ctenucha Cressonana, Grote, Proc. Ent. Soc. Phil., Vol. 2, p. 64. [Plate 8, fig. 5, ♀.] [1863].

"Anterior wings, blackish-brown with the median vein, its two middle branches and the sub-median nervule, striped with white. Costal margin, yellowish white. Exterior margin, fringed with white. Base of the wings tinged with metallic blue. Posterior wings, blackish blue, fringed with white. Collar and thorax, metallic blue; tegulæ, bordered with white. Head, orange, metallic blue between the eyes. Palpi, yellowish, terminal joint, black. Abdomen, metallic blue above, blackish beneath. Legs and antennæ, black."

Grote [loc. cit.]

Expanse of wings, 1.90 inches. *Length of body*, 0.75 inch.

Habitat.—Colorado Territory. [Coll. Ent. Soc. Phil., and Stretch.]

For my specimen of this fine species I am indebted to my friend, Mr. T. L. Mead. It was named by Mr. Grote after Mr. E. T. Cresson, of Philadelphia. In relation to the affinities of this species, Mr. Grote says: [loc. cit.] "This species is intermediate between *C. Latreillana*, Kirby, [C. Virginica, Charp.] and *C. Venosa*, Walker, and very distinct from either. In size it approaches the former, and in the shape of the wings and markings of the anterior pair, the latter species. In *C. Venosa*, the stripes on the anterior wings are, however, yellow, and there is a third on the sub-costo inferior nervule, which is wanting in *C. Cressonana*." There are other slight differences in the coloration of the palpi and fringes, but the markings of the anterior wings separate it readily from its congeners.

3.—CTENUCHA MULTIFARIA, (Plate 1. fig. 11.)

Apistosia ? multifaria, Walk., C. B. M. Lep. Het., Pt. 2. [1854].

Glaucopis rubroscapus, Ménétriès, En. Cor. Am. Mus. Pet., p. 142, Plate 14, fig. 7. [1855].

Apistosia ? multifaria, Clem. App. Syn. Lep. N. Am., p. 302. [1862.]

Ctenucha rubroscapus, Grote, Trans. Am. Ent. Soc. p. 331. [1868–9].

Ctenucha rubroscapus, Boisd., Am. Soc. Ent. Bel., p. 71. [1868–9].

"♂. Head, crimson on the vertex, occiput, and between the eyes; front, black. Labial palpi, entirely crimson, except the short terminal

article, which is black. Antennæ, long, black, closely bipectinate. Prothorax, above, black, behind the head, crimson. Tegulæ, largely crimson, at the sides, outwardly, these are narrowly and evenly bordered with black, and fringed with longer hair-like scales. Abdomen, brilliant cyaneous, changing to greenish, anal hairs black. Legs, black; anterior coxæ, whitish; middle femora, spotted with white above the tibial joint. Anterior wings, brownish-black above, much as in C. Virginica; the costal edge is entirely and markedly white from base to apices, the latter fringed with white, as in C. Ochroscapus. Fringes, black, except before internal angle, where they are prominently white. Secondaries, blueish-black, much as in C. Virginica; the fringes are white at apices and before anal angle, elsewhere black. Under surface, resembling upper. Grote [loc. cit.]

Expanse of wings, 1.90 inches. *Length of body*, 0.60 inch.

Habitat.—California. [Coll. Mus., Berol., Stretch, et als.]

This species differs in coloration from C. Ochroscapus, in having the head and patagia *crimson* instead of *yellow*, and the costa of the anterior wings prominently *white*. It is abundant round the Bay of San Francisco, frequenting low marshy places, and in this particular appears to differ widely from C. Ochroscapus, which is a true mountain insect. C. Multifaria flies in June and July; is exceedingly sluggish in its habits, and is frequently found clinging to the stems of grasses and carices, from which it may be easily shaken into the collecting net. When worn and faded, the vermillion of the head and epaulettes assumes an orange tint, but never the deep yellow so characteristic of C. Ochroscapus.

4.—CTENUCHA OCHROSCAPUS, (Plate 1, fig. 13.)

Ctenucha Ochroscapus, Grote, Trans. Am. Ent. Soc., Vol. 1, p. 330. [1868].

Ctenucha Corvina, Boisd., Ann. Soc. Ent. Bel., Vol. 12, p. 71. [1868].

♂. ♀.—Size of C. Virginica. Head, entirely orange yellow. Labial palpi, shorter than in C. Virginica, and held porrectedly against the front; the short terminal article is black, while the basal joints are entirely orange yellow. Antennæ, long, black, closely bipectinate; in the ♂ the pectinations are larger than in the ♀, but shorter than in C. Virginica ♀. Collar, dark cyaneous, bordered anteriorly and laterally with powdery orange yellow scales, which also obtain obso-

letely centrally. Sides of the prothorax, orange yellow. Tegulæ, largely orange yellow, narrowly and evenly black on the sides outwardly. Thoracic disc, dark cyaneous. Abdomen, above, bright cyaneous; beneath, black. Legs, black; in the ♂, inwardly shaded with obscure whitish. Anterior wings, dull black, with a faint cyaneons shade at base, immaculate. Fringes, black, except at apices, where they are prominently white, and are again faintly whitish before anal angle. Secondaries, black, shaded with cyaneous centrally and over internal margin; fringes, black, except at the apices, where they are white. Under surface, resembles upper, but more brownish."

Grote [loc. cit.]

Expanse of wings, 1.80 inches. *Length of body*, 0.60 inch.

Habitat.—California. [Coll. Mus. Berol.; H. Edwards; Stretch.]

Grote says of this species: "C. Ochroscapus and C. Multifaria differ from C. Virginica, and C. Cressonana in that, the head is slightly narrower behind, while the labial palpi are somewhat shorter and porrected. These differences do not seem to authorize their generic separation, since in the totality of their remaining characters they agree with the typical species of the genus, wnich they resemble in form, size, and in the style of ornamentation." [Grote. loc. cit.]

I have seen but three specimens of this species, and these were taken by my friend, Henry Edwards, Esq., at an altitude of about 4,500 feet, on the Sierra Nevada Mountains, in the neighborhood of the Yosemite Valley, in July, 1871. It was found in company with G. Hopfferi, frequenting streams and water courses, and did not appear to be rare, but exceedingly wild and rapid in its flight, and difficult to capture. It alighted frequently on the flowers, but was easily disturbed. These habits are very different to those of its nearest ally, C. Multifaria, and serve to add additional value to the specific characters as here given. These differences of flight, are often of great use in helping us to draw the line of specific differences, and should be more frequently observed than appears to have been the case heretofore.

5.—CTENUCHA BRUNNEA N. S.

♂. ♀.—Front, black. Palpi, except the terminal joint which is black, occiput, hind margin of the eyes, and internal margin of the patagia, bright scarlet. Thorax and abdomen, bright metallic blue. Legs, blackish, with the tips of the tibiæ whitish. Antennæ, long, and deeply pectinated in the male.

Anterior wings, clear pale brown, with the veins and all the margins of the wings blackish, and a few steel blue scales at the base. Extreme costa and fringes, white, interrupted with dusky about the middle of the outer margin. Posterior wings, velvety black, with metallic blue reflections; fringes, white, interrupted near the anal and apical angles with blackish. Beneath, as above, except that the anterior wings have a deeper tint, and the posterior wings are browner than above.

Expanse of wings, 1.90 inches. *Length of body*, 0.60 inch.

Habitat.—California. [Coll. Behr, H. Edwards and Stretch.]

This fine species was taken by Dr. Behr, of San Francisco, in Marin County, California, on the slopes of Mount Tamalpais, and I am indebted to him for the specimen in my collection. While more allied to C. Multifaria and C. Ochroscapus, than the other members of the genus, it is abundantly distinct from either. It was taken in swampy localities, sitting on the stems of carices, and shows but very little tendency to vary in its coloration, as the inspection of some ten specimens proves. This insect is also found on San Miguel Island, off the coast of California, my friend, W. Harford, having taken a number of specimens in that locality.

6.—CTENUCHA VENOSA, (Plate 1, fig. 12, ♂.)

Philoros venosa, Walk., C. B. M. Lep. Het., 1854.

Ctenucha venosa, Clem. App. Syn. Lep. N. A., p. 286. [1862.]

♂.—Antennæ, black. Front, metallic greenish blue. Vertex, vermillion red. Eyes, black. Palpi, black, with a few red and orange scales on the basal joint beneath. Patagia, blackish, narrowly bordered in front and on the inner margin with yellow. Legs, black, with greenish reflections on the femoræ. Thorax, blackish above; beneath, with greenish reflections. Abdomen, sericeous green above, blacker beneath.

Anterior wings, brownish black, with a greenish bloom, with three longitudinal yellow stripes, the first, abbreviated, on the sub-costo inferior nervule; the second on the median nerve, forking on its two middle branches; the third on the internal vein; the two latter both originate at the base of the wing, but none of the stripes reach the outer margin. Costa, narrowly edged with yellow on the basal two-thirds, with white on the apical third. Fringes, white, interrupted

with black on the middle of the outer margin. Posterior wings, black, with greenish reflections at the base. Fringes, white, interrupted on the outer margin with black.

Beneath, slaty black, with a greenish bloom, and green reflections at the base of the posterior wings.

Expanse of wings, 1.55 inches. *Length of body*, 0.55 inch.

Habitat.—Texas. [Coll. Capt. Pope, Smith. Inst.] Mexico. [Coll. Behr, Edwards, Stretch, etc.]

EXPLANATION OF PLATE I.

1.—Alypia dipsaci, Grote - - - California.
2.— " Sacramenti, Grote - - - "
3.— " Ridingsii, Grote - - - Pacific States.
4.— " Lorquinii, Grote - - - "
5.— " Similis, N. S. - - - California.
6.— " lunata, N. S. - - - - "
7.— " octomaculata, Fabr. - - Atlantic States.
8.— " Brannani, N. S. - - - California.
9.—Scepsis fulvicollis, Walker - - United States.
10.—Ctenucha venosa, Walker - - - Texas.
11.— " brunnea, N. S. - - - California.
12.— " multifaria, Walker - - - "
13.— " ochroscapus, Grote - - "
14.— " Cressonana, Grote - - - Colorado.
15.— " virginica, Charpentier - - Atlantic States.
16.—Psychomorpha Epimenis, Drury - - " "


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ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **PYROMORPHA.** H. S.

"Head moderate, free, vertex rather elongated, smooth; ocelli large. Face moderately broad, rounded, slightly protuberant. Eyes rather small, scarcely prominent. Antennæ with bases almost united, rather thick, but tapering at the tips, pectinated. Palpi extremely short. Tongue about half as long as the thorax beneath.

"Fore wings rather broad, ovate; the discal cell broad, behind fusiform. The subcostal vein sends two short, nearly erect, marginal nervules to the costa; and from the superior angle of the disc, arise two long nervules, on a short, common stalk, the lower one of which is the apical, but delivered rather above the tips. The discal vein is rather faint, and gives rise to two disco-central nervules, the upper one rather on the costal side of the wing. Median vein, four-branched; the posterior nervule arising a little behind the first marginal branch. The fold is thickened, and the sub-median shortly forked at the base. Hind wings ovate, as broad as the fore wings, and in length equal to that of the body, without costal vein. Sub-costal is furcate, the lower branch giving rise, at an obtuse angle, to a thickened discal vein, which is angulated above the medio-superior nervule, where it receives the discal fold, and above this is given off a single disco-central nervule. Median vein four-branched, with branches equi-distant, except the two superior ones.

"Body slender, cylindrical. Patagia minute, rolled. Abdomen not tufted at the tips or on the sides, about one-half the length of the body beneath. Legs slender; fore tibiæ, with a short, concealed spur on its middle; hind tibiæ, with two extremely minute apical spurs.

Clem. App. Syn. Lep. N. Am.

1.—PYROMORPHA DIMIDIATA. (Pl. 2, fig. 14.)

Pyromorpha dimidiata, H. S., Lep. Ex. Sp. Nov. Ser. I, fig. 222.
Malthaca perlucidula, Clem. Proc. Acad. Nat. Sci. Phil., p. 541. (1860.)
Malthaca perlucidula, Morris, Syn. Lep. N. Am., p. 134. (1862.)
Malthaca perlucidula, Clem. App. Syn. Lep. N. Am., p. 288. (1862.)
Lycomorpha dimidiata, Clem. App. Syn. Lep. N. Am., p. 288. (1862.)

♂. ♀.—Entire insect smoky black, except the basal half of the primaries *above the fold*, and the costa of the secondaries from the base to the middle, which are luteous. Wings somewhat diaphanous.

Expanse of wings, 0.95 inch. *Length of body*, 0.32 inch.

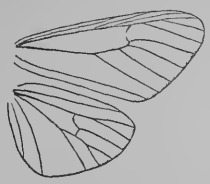
Habitat.—Atlantic and Western States. "Illinois, Mr. Kennicott, Maryland, Dr. Morris." *Morris.*

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **GNOPHÆLA.** Walker.

"Head moderate, rather small, as are the eyes, which are not very full; clypeus globose, swollen, projecting in front; two occelli, before and between which the epicranium is roundedly elevated, rising to a ridge behind; maxillæ moderately developed, when unrolled, not so long as the thorax. Palpi slender, extending beyond the head, held nearly horizontally and on a plane with the body, third article somewhat depressed, not pointed. Antennæ of the male somewhat shorter than those of the female, finely bipectinate, the pectinations tapering just before the tip, and are more separated and fewer, compared with the male antennæ in Ctenucha. In the female the pectinations are shorter and stouter, bearing terminal setæ. Legs unarmed and finely scaled. Abdomen somewhat exceeding posterior wings. Quite similar in external conformation in both sexes.



"Anterior wings more than twice as long as broad; costal margin straight, slightly depressed before costal angle; external margin rounded, not very oblique; internal margin straight. Discal space open; sub-costal nervure arcuated before the apex, crowding the nervules together; first and second sub-costal nervules approximate at base; third being short, throwing off a branchlet just before the margin; second thrown off before the fifth, on the opposite side of the vein, while in *Ctenucha* it arises much beyond; apical interspace widening towards costa; fifth sub-costal nervule thrown off directly from the nervure, not removed as in *Ctenucha*, towards the middle of the discal area. First and second median nervules united at base; second greatly nearer the first than the third, which latter is bent downwards; fourth much removed from third. Sub-median nervure perfectly straight, and parallel with internal margin.

"Posterior wings nine veined; discal space partially closed, the vein becoming towards the centre a mere thickening of the membrane.

The costal nervure is perfectly straight, sending off, immediately at base, the upper discal nervure, which is slighter, nearly straight, and throws off a nervule near external margin. Lower discal nervule (median) nearly straight; the third median nervule springing from the second, its origin further removed towards the external margin than that of the first. Sub-median nervure curvilinear, much removed from median; internal nervure arising from the base of the wing, straight, short.

"The ornamentation is black, with sub-cyaneous abdominal and alar shades; the veins are black, regularly defining large white * patches on both wings. The insect (G. Vermiculata) mimics the butterfly *Stalachtis heliconoides*, H. S. The thoracic and capital tegument, when denuded of scales, is pitch black, shining, as are the veins. Where the wing scales are black, the membrane beneath is of a pale, blackish hue; where they are white it is pale yellowish. The prothorax beneath, and the anterior femora above, are covered with orange-yellow hairs, as in allied genera, but these do not spread on the occiput above.

"Allied to *Ctenucha*, Kirby, than which I consider it of higher value. In that genus, the ♂ antennal pectinations are more numerous and the stock longer. The palpi in *Callalucia* (*Gnophœla*, Walker,) are shorter, not so flexuous, and third article is differently shaped, though somewhat similarly held. The nervulation differs much from Ctenucha, since the third subcostal nervule is furcate; discal space open. In *Ctenucha*, the posterior wings are seven-veined, first, second and third nervules of the lower discal vein springing from one point, and the costal and internal nervules are wanting."

Grote, Proc. Ent. Soc. Phil., vol. 4, p. 315. (1865.)

The above diagnosis is drawn from *G. vermiculata*, and appeared under the name of *Callalucia*, Grote, which equals *Gnophœla*, Walker.

1.—GNOPHÆLA VERMICULATA. (Pl. 2, fig. 1.)

Omoiala vermiculata, Grote, Proc. Ent. Soc. Phil., vol. 2, p. 334. (1863.)

Lamprosoma vermiculata, Grote, Proc. Ent. Soc. Phil., vol. 2, pl. 6. fig. 1, ♂. (1863.)

Callalucia vermiculata, Grote, Proc. Ent. Soc. Phil., vol. 4, p. 316. (1865)

Gnophœla vermiculata, Grote, Trans. Am. Ent. Soc., vol. 1, p. 332. (1868)

* *White* must be unintentional; both species are yellow.—R. H. S.

♂. ♀.—Black and yellowish white. Palpi black. Head black, with scattered, whitish scales on the front, vertex, and behind the eyes. Prothorax and patagia black, with scattered whitish hairs. Prothorax beneath, clothed with orange hairs, which color also extends between the anterior pair of legs. Thorax and abdomen black, with deep, blueish reflections, the latter ornamented with a very narrow, white, stigmatal line. Legs black, with a few whitish scales about the tips of the joints, tibial spurs of the posterior pair white.

Wings black, with large, semi-diaphanous, yellowish white spots. Anterior pair, with a large discal spot divided into three parts by the black median vein and its fourth branch. Of these, the upper lies in the discal area, terminating somewhat obliquely at the origin of the first median nervule, and reaching rather more than half way to the base of the wing. The lower lies beneath the median vein, and is bounded by the fold in the interspace; it extends nearly to the base of the wing, and terminates on the fourth median nervule, midway between its origin and the outer margin of the wing. The middle spot lies between the median vein and its fourth nervule, and is sharply angulated outwardly. There is in addition, a broad, oblique, curved transverse band across the nervules, neatly divided by the black nervules into four unequally oblong spots. Fringes black, very slightly white at the apices.

Secondaries with a large discal patch lying between the sub-costal vein and the sub-median fold, and terminating outwardly, about half way between the origin of the nervules and the outer margin of the wing. Veins and nervules black. Fringes black, whitish at the apex and anal angle.

Expanse of wings, 1.75 inches. *Length of body*, 0.70 inch.

Habitat.—Colorado Territory. (Ridings and Mead.)

Of the habits of this well marked species, I can learn but little, except that, like its cogener, *G. Hopfferi*, it is abundant, though local. The specimen from which the figure was drawn, was one of sixteen which my friend, T. L. Mead, had in his net at the same time. These were taken on one spot in a few minutes, and during the balance of a season's collecting, he met but one other specimen. The original type was collected by Mr. James Ridings. It has not occurred, so far as I know, outside of the locality named.

2.—GNOPHÆLA HOPFFERI. (Pl. 2, fig. 2.)

? *Glaucopis latipennis*, Boisd., Lep. Cal., p. 27. (1852.)

Gnophæla Hopfferi, Grote, Trans. Am. Ent. Soc., vol. 1, p. 332. (1868.)

"♂.♀.—Size large. Head black. Labial palpi black, except at base, where they are powdered with orange-yellow scales. Sides of the pro-thorax orange yellow, which color extends between the anterior legs at base. Legs black, slightly touched with white; the minute spurs on middle and hind tibiæ are white. Thoracic region, above and beneath, black. Abdomen cyanous black; a white, lateral, stigmatal line, as in G. vermiculata. Wings large and full. Primaries trigonate, brownish black, with three dull, lemon-yellow spots at the middle, divided by the median nervure and its fourth nervule; between this latter at base, and the continuation of the nervure, the outer and smallest is placed. The upper spot, at the outer extremity of the discal cell, is restricted as in G. æquinoctialis. Over the nervules, terminally, is an oblique series of four interspaceal, unequal, ovate, yellow spots, of which the second and largest is placed opposite the discal cell; these spots are further apart than in G. æquinoctialis or G. vermiculata. Secondaries resembling primaries in coloration and ornamentation, but with a very faint bluish reflection. A large central, yellow patch, analagous to the spots at the middle of primaries, is divided by the median nervure into two unequal spots, while the third, at the base of the fourth median nervule, is obsolete. Two ovate yellow spots are situated opposite the disc, and are separated by the black, first median nervule. Under surface of both wings resembling upper. The fringes on either pair are black, faintly touched with white at the apices of primaries and costal angles of secondaries." (Grote, loc. cit.)

Expanse of wings, ♂, 2.10; ♀ 2.30 inches. *Length of body*, ♂, 0.75; ♀, 0.80 inch.

Habitat.—California. (Coll. Edwards, Behrens, Behr, etc.) (Coll. Mus. Berol., and Dr. Felder, Vienna, auth. Grote.)

This fine species was named by Mr. Grote after Mr. C. Hopffer, the well-known Lepidopterist of Berlin. It was readily distinguished from G. vermiculata, by its superior size, the deeper tint, of the yellow markings and the larger proportion of black in the coloration; the external margin of the secondaries is also more angulated than in the lat-

ter species. *Glaucopis latipennis*, Boisd., (Am. Soc. Ent. Belg., vol. 12, p. 27, 1868–9), and Morris (Syn. Lep. N. Am., p. 136), is probably the present species, but the description is too vague to make the determination absolute without inspection of the types. The insect is found in the foot-hills of the Sierra Nevadas, and, though apparently local, is not uncommon where it occurs.

Since the above was in type I have seen a series of fine specimens of this insect in the collection of Lord Walsingham, taken by him in Oregon during his recent visit to this coast. They differ in no wise from those found in California.

ZYGÆNIDÆ.

ZYGÆNIDÆ.

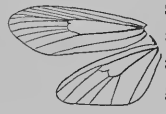
Genus **LYCOMORPHA**, Harris.

"The front of the head is provided with long scales extending to the base of the maxillæ. When the head is denuded, the clypeus is broadly scutellate, the length being equal to the breadth, with the basal margin produced backwards, and encroaching more on the epicranium than usual. The front edge contracts suddenly into a square portion resting above the mandibles and maxillæ. The epicranium is small and short, deeply impressed by a mesial line and divided thereby into two triangular halves; while the occiput is transversly oblong, being twice as broad as long.

"The antennæ have short setiferous densely scaled pectinations; in the female they are serrated, the teeth terminating in single setæ. Mandibles rather long and slender, projecting out beyond the scales of the front.

"The body of this genus is long and narrow, slender. The thorax is narrow, and the pleuræ of each thoracic segment are very oblique. Pro-thoracic scales (being the two halves of the pro-scutum) ovate elliptical. The meso-scutum is remarkably small, being shorter than broad, and no longer than the scutellum, which is of much greater length than usual. The form of this last piece is much different from what we find in *Ctenucha*. In form it is pentagonal, the front edge being transverse, the two posterior sides forming a triangle, while the two anterior sides are, though nearly parallel, yet slightly divergent.

"Wings remarkably long and narrow; primaries nearly three times as long as broad, being remarkably long and narrow as in the Lithosiæ. Costa straight as far as the apex, which is much rounder than usual as is also the internal angle, while the inner edge is but one-fourth shorter than the costal. The nervules arise remarkably equidistant, and their origins are much shorter and nearer the outer edge than in the allies of the genus. The short subcostal nervules run rapidly to the costal edge. First, second and fifth of equal



lengths, the third not branched and equal in length to the fourth, while the origins of each are opposite the inner third of the fifth, which arises near the middle of the discal space. Two discal nervules of equal length meet to form an angle pointing inwards, from which a fold is thrown inwards along the middle of the discal space. Median nervules much straighter than usual, their interspaces oblong, and of very equal size. Origins of second, third and fourth equidistant. Submedian nervure long and distinct.

"Secondaries long and narrow, the apex much produced, the inner angle not reaching to the tip of the abdomen. Costa convex, a little excavated just before the apex. Outer margin two-thirds as long as the costa, angulated slightly on the second median. Inner edge very short, being one-half as long as the costal. First and second subcostal nervules nearly equal in length. The upper discal is very long and oblique, and with the lower discal is parallel with the outer edge of the wing. But three median nervules present. First, obsolete; second and third, parallel; third and fourth shorter than the second and directed downward. Distance between the two first median nervules one-third as great as that between the third and fourth.

"The slender abdomen is a little more than twice the length of the head and thorax.

"The coloration is Prussian blue, with saffron bases to the wings, somewhat as in *Pyromorpha*.

"Compared with other genera of the sub-family, this interesting genus presents some notable differences, all the characters being, as it were, influenced by the close relationship to the Lithosiæ. This is seen in the dentated antennæ, neither simple as in the Lithosiæ, nor pectinated as is the rule in its own group. The Lithosian characters also appear in the head, in the form of the clypeus especially; and in the unusually slender body, with its narrow wings, and elongated scutellum of the meso-thorax. Though after all the Zygænic characters prevail so extensively that it is a little strange that observers after Dr. Harris' time should change his location of the genus to a place among the Lithosiidæ. Though the larva is a lichen-feeder and thus in this early stage is like Lithosia and allies, we must consider the insect as simply analogous in its habits as well as structure to that genus, and not be misled by these strong resemblances."

Packard, Proc. Essex Inst., April, 1864.

The three species found in the United States may be tabulated thus:

* Fore wings bicolorous.
† Base yellow - - - - *L. Pholus.*
Base Red - - - - *L. Miniati.*
* Fore wings concolorous, pale brick red - *L. Palmerii.*

1.—LYCOMORPHA PHOLUS. (Pl. 2, fig. 3.)

Sphinx pholus, Drury. (1770.)
pholus, Fabricius, Sp.. Ins., vol. 2, 166, 49. (1781.)
Lycomorpha pholus, Harris, Sill. Am. Jour. Sci., vol. 36.
Glaucopis pholus, Harris, Ins. Inj. Veg., p. 341, fig. 164. (1862.)
Glaucopis pholus, Morris, Syn. Lep. N. Am., p. 135. (1862.)
Lycomorpha pholus, Clem., Syn. Lep. N. Am. App., p. 289. (1862.)

♂. ♀. Entire insect deep blue-black, almost black, with the exception of the patagia and the basal half of all the wings, which are orange.

Expanse of wings, 1.20 inches. *Length of body*, 0.40 inch.

Habitat.—Northern Atlantic States.

Larva.—"Pale green, with yellowish spots running into green; head black, covered with a few short, whitish hairs; body sparingly clothed with rather long hairs, which are white on the sides and black on the back, the hairs arising singly from minute tubercles, those on the third segment the longest, and with the others before them directed forward. It eats the lichens on stone heaps and shady places, and undergoes its transformations in a thin silky cocoon." *Harris.*

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **ANATOLMIS.** Packard.

"Head of moderate size, broad and short. Occiput and epicranium together, equal in length to the clypeus; epicranium bilobate, much as in Lycomorpha, with much the same proportions. The clypeus is very broad, scutellate, just as broad as long, covered with broad flat scales which converge towards the median line. Eyes small, hemispherical, their diminished size adding to the breadth of the small clypeus between them. Antennæ situated nearly midway between the front edge and the base of the head; rather slender, with very short broad pectinations equalling in length the joints, and covered densely, especially on the sides, with stout hairs, and terminating in a single seta. Maxillæ well developed, longer than the head is broad. Palpi long, porrect, reaching beyond the front; third joint minute conical subacute, nearly continuous with the second, which is not very broad.

"Body slender, thorax, not much broader than abdomen; wings remarkably long and narrow. Primaries a little more than three times as long as broad; costa very straight, a little convex on the outer third; apex rounded; outer edge very convex, very short; inner edge remarkably long, and nearly parallel with the costa, very straight, the usual convexity near the insertion very slight.

"Costal very near the margin, and infringing on the middle of the



first subcostal; third subcostal of very equal length, first curved towards the costa, the third shorter than the first; fourth branched within its middle, enclosing a narrow long triangular apical interspace; fifth, not removed from its nervule at its origin. Median, nervules arise at the outer third of the wing. First and second are united at their base; third and fourth are equidistant from the second. Submedian curve long, well marked, but no nervure. Very long internal nervnre. Fringe rather long, especially just below the apex.

"Secondaries very long, twice as long as broad, narrow triangular, hardly reaching to the tip of the abdomen. Apex much produced,

though obtuse. Costa very straight, outer edge very long, remarkably straight, internal angle rectangular, not reaching much beyond the base of the anal tuft.

"Subcostal divides near the outer fourth of the wing ; first and second median very short, nearly parallel ; third very remote, but of the same length.

"Legs long and slender, finely scaled. Hind tibial spurs very small unequal acute, inner pair very remote, and half as large as the terminal pair. Tip of abdomen provided with large anal valves of unusual size, being laterally broad lanceolate.

"The squamation is fine and powdery, compared with *Lycomorpha*, to which it is nearest allied, besides the very different style of coloration, the primaries are narrower, costa straighter, secondaries more triangular, owing to the rectangular inner angle. But in the structure of the head, of the antennæ, of the thorax and abdomen, it agrees closely with *Lycomorpha*, and these characters are those which place it without doubt in the Zygænidæ, though after a casual glance one would not hesitate to call it a Lithosian. The blueish scales of the body, the dark mahogany-colored tegument, the fine powdery squamation, and the slender, very equally jointed legs and pectinated antennæ aid in determining the true position of this interesting genus.

"From the resemblance to the parallel genera, *Hypoprepia* and *Atolmis*, among the Lithosiidæ I have proposed the name above given."

Packard, Proc. Essex Inst., April 1864.

1—ANATOLMIS GROTEI. (Pl. 2, fig. 4.)

Anatolmis Grotei, Packard, Proc. Essex Inst. (1864.)

♂. ♀.—Vermillion red and smoky purple. Head and appendages blackish, thorax red. Primaries red throughout, except the fringe and the edge of the outer third of the costa, which are a deep smoky purple, nearly black. Secondaries red on the basal third, beyond smoky purple ; the red extends from just within the middle of the inner edge to near the apex upon the costal edge. Legs purple, concolorous with the abdomen. Beneath colored the same as above. There are no other markings on the wings.

Expanse of wings, 1.30 inches. *Length of body*, 0.45 inch.

Habitat.—Colorado Territory, (Coll. Phil. Ent. Soc., T. L. Mead, H. Edwards, R. H. Stretch.)

The original type of this species was from Pike's Peak, Colorado Territory, (loc. cit.); the specimen from which the figure was drawn was kindly presented to me by Mr. T. L. Mead, who took it in the same locality.

BOMBYCIDÆ.

LITHOSIINÆ.

Genus **HYPOPREPIA.** Hübner.

" Body stout, rather short, elongato-subfusiform. Head rather small. Palpi stout, very much shorter than the head ; third joint acuminated, not half the length of the second. Tongue short. Abdomen oblanceolate, not extending quite so far as the hind wings. Legs moderately stout ; hind tibiæ with two minute apical spurs. Wings moderately broad, not long. Primaries slightly convex in front ; the hind angle somewhat rounded ; first and second inferior veins almost contiguous at the base ; third about eight times nearer to the second than to the fourth." *Clemens*, Syn. Lep. N. Am., p. 303.



1.—HYPOPREPIA FUCOSA. (Pl. 2, fig. 12.)

Hypoprepia fucosa, Hübn., Zutr. Dritt. Hand., p. 21, figs. 471, 472. (1825.)

Lithosia miniata, Kirby, Fauna, Bor. Amer., pl. 4, p. 305. (1837.)

Gnophria vittata, Harr., Rt. Ins., Mass., p. 241. (1841.)

Hypoprepia fucosa, Walk., B. M. Cat. Lep., p. 487. (1854.)

Lithosia miniata, Walk., B. M. Cat. Lep., p. 512. (1854.)

Atolmis tricolor, Fitch, Third Report. Ins. N. Y., p. 168. (1856.)

Atolmis? miniata, Clemens, Proc. Acad. Nat. Sci. Phil., p. 544. (1860)

Gnophria vittata, Morris, Syn. Lep. N. Am., p. 256. (1862.)

Hypoprepia fucosa, Clem., Syn. Lep. N. Am. App., p. 303. (1862.)

Packard, Proc. Ent. Soc., Phil., vol. 3, p. 98.

♂. ♀.—Palpi pale reddish, tips black. Head, thorax, and patagia scarlet, sometimes inclining to yellowish. Abdomen lead color, scarlet at the base and tip, and with a broad ventral streak of the same color.

Primaries lead color, narrowly margined on the costa and outer margin, and also on the basal three-fourths of the inner margin with

scarlet. There is besides, a broad longitudinal stripe of the same color, furcate on the outer half of the wing. Fringes lead color. In many specimens the scarlet of the wings is paler, and the costa and basal half of the central stripe are strongly yellowish.

Secondaries scarlet, with a broad outer plumbeous band. In those specimens which show yellow tints on the primaries the secondaries are much paler, and the outer band is reduced to half its width, and strongly sinuated on its inner edge. Fringes slate color, concolorous with the outer band.

Expanse of wings. 1.10–1.30 inches. *Length of body*, 0.40–0.50 inch.

Habitat.—Eastern States, Maine, (Verrill); Mass., (Sanborn Shurtleff); Mich., (Miles); Georgia, (Walker.)

Larva.—Of the larva Dr. Harris says, (Ins. Inj. Veg., p. 342, Ed. 1862): "The caterpillar lives upon lichens, and may be found under loose stones in the fields in early spring. It is dusky, and thinly covered with stiff, sharp, and barbed black bristles, which grow singly from small warts. Early in May it makes its cocoon, which is very thin and silky; and twenty days after is transformed to a moth."

BOMBYCIDÆ.

LITHOSIINÆ.

Genus CISTHENE. (Walker.)

Male.—Body rather short, moderately stout. Palpi much shorter than the head; third joint conical, acuminated, less than half the length of the second. Antennæ stout, setose, setaceous, rather more than half the length of the body. Abdomen not extending so far as the hind wings; tips forcipated. Legs moderately stout, hind tibiæ with four rather long spurs. Wings moderately broad, not long. Fore wings very slightly convex in front, oblique at the tips; rounded and not angular behind; third inferior vein fully twice further from the second than the second from the first; fourth nearly twice further from the third than the third from the second.



The two California species of this genus feed on plants belonging to the anomalous genus *Byssus*, and occur in Dr. Behr's manuscripts under the name of *Byssophaga*. The three species found in the United States may be tabulated thus:

* Hind wings pale tawny.
 † Band on ant. wings reaching the costa - *C. faustinula.*
 Band on ant. wings not reaching the costa - *C. nexa.*
* Hind wings rosy.
 † Fore wings with transverse band - - - *C. unifascia.*
 Fore wings with spot on costa and inner margin - *C. subjecta.*

1.—CISTHENE FAUSTINULA. (Pl. 2, fig. 10.)

Lithosia faustinula, Boisd., Am. Soc. Ent. Belg., vol. 12, p. 73. (1868.)

♂. ♀.—Head, palpi, antennæ, thorax and its appendages tawny white; eyes black; abdomen tawny. Anterior wings with the costa nearly straight, somewhat rounded near the apex; smoky gray in color, with a short, narrow, marginal streak at the base of the wing, on the inner margin, and a transverse band beyond the middle, twice constricted, and somewhat broadest on the inner margin, of a pale tawny or dirty white, the adjacent portions of the wing being somewhat darker

in tint than the general color. Posterior wings pale tawny white, very narrowly margined with pale smoky gray at the apex. Fringes of all the wings concolorous with the adjacent portions of the wings. Beneath as above, except that the band on the anterior wings is somewhat less clearly defined.

Var. fusca. The markings are identical, but all the portions which are dirty white in the type, are pale smoky gray, nearly concolorous with the anterior wings.

Expanse of wings, 1.00 inch. *Length of body*, 0.35 inch.

Habitat.—California, (Coll. Edwards, Behr, Behrens, etc.)

This species is found in the wooded districts round the bay of San Francisco, but is less abundant than the following. The variety *fusca*, from the collection of Dr. Behr, was taken abundantly in Napa valley.

2.—CISTHENE NEXA. (Pl. 2, fig. 11.)

Lithosia nexa, Boisd. Ann. Soc. Ent. Belg., vol. 12, p. 74. (1868.)

Cisthene grisea, Packard, Rep. Peab. Acad, Sci. (1872.)

♂. ♀.—Head, antennæ, palpi, thorax, legs and abdomen pale tawny white. Anterior wings with the costa straighter than in *C. Faustinula*, clear smoky gray, with a short streak on the inner margin at the base of the wing, and a triangular spot with serrated edges, having its base on the inner margin and extending somewhat beyond the median vein, pale tawny white. The projecting points of this spot are edged with black at their apices. Posterior wings pale tawny white, largely clouded with pale smoky gray at the apices. Fringes concolorous with the adjacent portion of the wings. Beneath as above, except that the gray shades are deeper and more uniform in tint, and the spot on the anterior wings more contracted in area.

Expanse of wings, 0.85 inch. *Length of body*, 0.30 inch.

Habitat.—California, (Coll. Edwards, Behr, Behrens, etc.)

This species is found in woods round the bay of San Francisco. It may be readily distinguished from *B. Faustinula*, by the larger apical cloud on the posterior wings, by the band on the anterior wings not reaching the costa, and by its smaller size. It is also much more abundant.

BOMBYCIDÆ.

LITHOSIINÆ.

Genus CLEMENSIA.* Packard.

"Head large, front broad, clypeus triangular, very broad between the antennæ. Antennæ very slender, simple, with fine setæ beneath; ♀ still more filiform and without setæ. Palpi three-jointed, free from the head, porrect, the whole of the third joint reaching beyond the front of the head, and only one-fourth shorter than the second joint, acutely pointed. Maxillæ long and slender, reaching to the second pair of coxæ when extended.

"Thorax just as long as broad, of equal width with the abdomen. The pro-thorax is badly separated from the meso-thorax. Patagia slight, not reaching beyond the base of the meso-scutellum.

Primaries a little more than twice as long as broad. Costa continuously convex from base to sub-acute apex; outer edge very oblique, a little more than half as long as the inner edge, which is especially convex at the basal half. Costal region very broad, first to fourth subcostal nervules very short, equal in length, and going rapidly to the costal edge; the fifth subdivides within its middle and the triangular interspace between the two branches is twice as long as broad. Sixth subcostal and first median nervules are parallel and of the same length. The three first median nervules arise very near together, while the fourth is remote as usual, and arises just within the middle of the length of the wing.

"Secondaries broad triangular; reaching to the base of the anal tuft, apex a little produced; costa convex throughout, from base to apex, internal angle well rounded. Subcostal subdivides midway between the apex and discal nervules, enclosing a triangular space. The three upper median nervules are very approximate, their interspaces narrow, linear. Legs long, slender, with four sub-equal, very long acute tibial spurs which are a little shorter in the ♀. Abdomen stout, broad as the thorax and four times as long. In ♂ a broad obtuse anal tuft,

* Named after the late Dr. Brackenridge Clemens.

in ♀ its cylindrical tip is suddenly truncate, not narrower than the base of the abdomen. * * *

This genus is closely allied to, and yet very distinct from *Miltochrista* of Europe. The head is broader between the antennæ which are stouter, and the palpi are larger and longer. The costa of the wings are fuller, the outer edges more oblique, and consequently the apex more acute than in *Miltochrista*. The neuration is very distinct from the European genus, since the subcostal nervules are shorter, the three first median nervules much nearer at their origins and throughout their length, and the fourth median arises near the middle of the wing, while in *Miltochrista* it arises at the basal third of the wing. In the secondaries the triangular apical interspace is shorter and broader in *Clemensia*. The legs are longer, slenderer, as are the tibial spurs which are nearly twice the size of those in *Miltochrista*."

Packard, Proc, Ent. Soc. Phil., vol. 3, p. 102. (1864.)

1.—CLEMENSIA ALBATA. (Pl. 2, fig. 13, ♀.)

Clemensia albata, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 103. (1864.)

"White with ashen and brown scales, dark spots and a black lunate discal spot. Front grayish white. Edges of the prothoracic scales pure white. Thorax and abdomen with grayish scales; anal tuft white.

"Primaries with six or seven black costal spots. Midway between the base of the wing and the discal spot, a sinuate abbreviated line proceeding from the fourth costal spot to just below the median nervure. A dot below on the internal nervures. A slight black streak on each side of the fourth median below the discal spot. Between this median spot and the base of the wing, in the ♂, a slightly tawny discoloration. Outer edge of the wing clear white. Marginal row of black dots fine, but very distinct. Fringe clear white.

"Secondaries white but finely dusted with gray scales, gathered into a diffuse, very indistinct extra-mesial line. No discal dot.

"♀ is clearer white, the extra basal line is much less distinct than in the ♂, consisting of a linear spot connected with the costal one.

Expanse of wings, ♂ 0.83, ♀ 0.90 in. *Length of body*, ♂ 0.35, ♀ 0.40 in.

Habitat.—New England States. Norway, Me., (Mus. Comp. Zool., Smith.) Brunswick, Me., Augusta."

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 103. (1864.)

BOMBYCIDÆ.

LITHOSIINÆ.

Genus **EUPHANESSA.** Packard.

"The head is much elevated behind the antennæ, the epicranium divided on its surface into two bosses. Clypeus much elevated, surface convex. The front narrows rather rapidly anteriorly. Antennæ simple, scaled above and on the sides, setose beneath. Palpi porrect, passing nearly one-half their length beyond the front. Primaries two-thirds as broad as long; costa rounded towards the apex. Outer margin oblique, almost as long as the inner margin. Internal angle rounded. Costal nervure bent down towards the subcostal, parallel at its termination with the three subcostal nervules. A scalene triangular area below the subcostal, one of the two shorter sides of which consists of the common base of the fourth and fifth subcostal; the other, by the anastomosis of the fourth subcostal with its main nervure. The first median becomes independent, arising from the middle of the discoidal area.



"Secondaries nearly as large as the primaries, very broad. Outer margin full, rounded, internal angle about midway in the wing, the internal edge being short. Scales minute, thin, wings semi-transparent in spots.

"This genus differs from *Nudaria*, with which it has been confounded by Walker and subsequent writers, in the smooth finely-scaled narrower front, while the antennæ are not tufted at the base as in the European genus. Besides the palpi are much longer, and project far beyond the front; the triangular fore wings are much broader and they have straighter costæ than in *Nudaria*. In the last named genus also, the inner edge is *nearly twice as long* as the outer, while in Euphanessa it is considerably *shorter* than the outer edge. The secondaries in our genus reach much farther beyond the tip of the abdomen. There are, moreover, constant differences in the neuration of the two genera."

Packard, Proc. Ent. Soc., Phil., vol. 3, p. 102. (1864.)

1.—EUPHANESSA MENDICA. (Pl. 2, fig. 9.)

Nudaria mendica, Walker, Cat. Lep. B. M. II., p. 576. (1854.)

Eudule biseriata, H. S. Lep. Exot., p. 19, fig. 441. (1855.)

Nudaria ? mendica, Clem., Syn. Lep. N. Am. app., p. 300. (1864.)

Euphanessa mendica, Pac., Proc. Ent. Soc. Phil., vol. 3, p. 102. (1864.)

♂.♀.—Entire insect pale, ochreous yellow, with the wings subdiaphanous, the costa and outer margins being somewhat darker. Eyes black. Anterior wings with two oblique, irregular, transverse, pale grayish bands, made up of irregular shaped spots. The basal band consists of a large subquadrate spot on the discal area, a much reduced rounded spot immediately below the median vein, and another of the same size above the internal vein and nearer the base of the wing. The outer band lies across the nervules, is very irregular, and consists of unequal spots in the interspaces; its inner side is nearly straight, except a projection thrown out to the discal vein; the outer side is irregularly dentate. There is a small spot on the outer margin, about midway between the apex and internal angle. Posterior wings immaculate.

Expanse of wings, 1.10 inches. *Length of body*, 0.45 inch.

Habitat.—New England States and Canada, (Auth. Sanborn, Packard and Saunders.)

This insect appears to be but little liable to variation. Packard states that it is common in low swampy grounds or dry pine woods in July.

After Plate 2 was engraved, I found the following notes in relation to this species, which throw considerable doubt on the classification of this insect with the Bombycidæ, and seem to indicate that it ought to be referred to the Geometridæ. Mr. Saunders (Can. Ent. vol. 3, p. 227,) writes: "A female of this species deposited eggs on the side of a box, in which it was confined, on the 2d and 3d of July. They were of a bright red color, and the young larvæ were hatched from them on the 8th of the same month. They were extremely active, about one-tenth of an inch long, with cylindrical bodies, and true geometers in their larval characteristics and mode of progression. The following description was taken at this stage in their history.

"Head large, bilobed, dark brown. Body above dull brownish green, with a slight pinkish tinge, and with many short black and brown hairs. Under surface similar to the upper; feet and prolegs—*of which latter there were only two pairs*—greenish and semi-transparent."

All efforts to find suitable food for these larvæ failed, so that their

subsequent history is still unknown. It is greatly to be hoped that Mr. Saunders will yet succeed in solving this question ; as our knowledge now stands, it seems not unlikely that this insect must be ultimately removed to the Geometridæ.

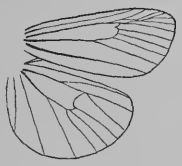
BOMBYCIDÆ.

LITHOSIINÆ.

1.—UTETHEISA. Hübner.

"Head small, smooth, with ocelli. Eyes prominent. Antennæ simple in each sex, rather short and slightly pilose beneath in the males. Palpi curved, ascending nearly to the middle of the face, squamose, basal joint tumid, middle joint long, terminal joint short, ovate. Tongue about equal to the thorax beneath.

"Fore wings elongate-trigonate, length exceeding that of the body by at least one-third; subcostal vein with a narrow cell above the discal vein, with a single marginal branch arising anteriorly to it and one from its hinder apex; the subcostal vein continues towards the tip of the wing from the apex of the subcostal cell subdividing into post-apical and apical branches, the latter furcate. Discal vein simple, angulated. Median four-branched, the posterior very remote from the other branches.



"In the hind wings the subcostal vein is bifid from the origin of the discal. *Clemens*, Syn. Lep. N. Am., p. 313.

The species of this genus are of wide geographical distribution, and their unusual variation renders the limitation and determination of the species a most difficult task, and one which can only be solved by a thorough knowledge (which we do not at present possess,) of their preparatory stages. U. pulchella of Europe is claimed by many writers to be identical with an Australian species which also occurs as far north as the Phillipine Islands; and there are many reasons why the three forms found in North America, and which I have enumerated as specifically distinct, should be united under one common name. It is somewhat surprising that common as this insect is in some localities, its history should not be better known. It may be that some fortunate individual has raised it from its larval stage, but has failed to make its history a matter of record. To any such I can only say that there is no more important service to be rendered to the science than the care-

ful study and *record* of Embryological conditions, and no more inviting and interesting field. The mere collection, preservation, and comparison of the imaginal forms, however requisite, will never lead us to a true knowledge of what should really constitute a species, and the wonderful revolutions resulting from the study of the early history of many species, will amply reward and interest the student.

1.—UTETHEISA BELLA. (Pl. 2, fig. 15.)

Tinea bella, Linn., Syst. Nat., p. 885. (1767.)

Noctua bella, Drury, Exot., vol. 1, p. 51, pl. 24, fig. 3. (1770.)

Bombyx bella, Fabricius, Syst. Ent., p. 585. (1775.)

Phalæna bella, Cramer, Exot., vol. 2, p. 20, pl. 109, fig. c.d. (1779.)

Bombyx bella, Fabr., Sp. Ins., vol. 2, p. 203. (1781.)

Bombyx bella. Fabr., Mant. Ins., vol. 2, p. 131. (1787.)

Bombyx bella, Fabr., Ent. Syst., vol. 3, p. 479. (1793.)

Utetheisa bella, Hübner, Verz., Schmett, p. 168. (1816.)

Deiopeia bella, Westn., Ed. Drury, vol. 1, p. 46, pl. 24, fig. 3. (1837.)

Deiopeia bella, Walker, C. B. M. Lep., pl. 8, p. 568. (1854)

Deiopeia bella, Morris, Syn. Lep. N. Am., p. 251, app., p. 313. (1862.)

Deiopeia bella, Harris, Ins. Inj. Veg., New Ed., p. 342, pl. 6, fig. 3. (1862.)

Utetheisa bella, Pack., Proc. Ent. Soc. Phil., p. 105. (1863.)

Grote, Proc. Ent. Soc. Phil., vol. 5, p. 234.

♂. ♀.—Palpi whitish, apical joint black. Head white, with a transverse black spot on the vertex, and a bilobed black spot on the front. Prothorax white, with two black dots and the extreme sides yellow. Patagia white, yellow at the base, with two black dots on each. Thorax whitish, with three pairs of black dots. Abdomen whitish above, banded with black beneath. Thorax beneath spotted with black.

Primaries *lemon yellow* to *orange*, with six transverse white bands, each containing a series of black dots. The first band is immediately at the base of the wing, while the fifth scarcely reaches the costa, and unites with the sixth about the middle of the wing. The outer margin has a row of interspaceal black dots, narrowly margined interiorly with white. Fringes white with dusky markings.

Secondaries *pink*, varying in intensity, with a narrowly white bordered black outer margin, widest at the apex, where it encloses a pink costal spot, having also beyond the middle of the outer margin, an enlargement towards the middle of the wing. There are also traces of two similar spots on the costa. Fringes white.

Beneath all the wings are deep red, with the costa of the primaries yellowish. The white bands of the primaries do not appear, but the black bands are more prominent, as the spots are more or less confluent, and appear as broken black bands. The markings of the secondaries are reproduced except that the two costal spots are deep black and very conspicuous.

Expanse of wings, 1.55 inches. *Length of body*, 0.65 inch.

Habitat.—Atlantic States, from Massachusetts to Texas. (Coll. generally.)

The above description is drawn from a full colored specimen from Massachusetts, presented to me by F. Sanborn. I have before me four specimens from the northern Atlantic States and five from Texas. The only difference of note, is the varying intensity of the yellow of the primaries, those specimens which are palest having the black spots reduced in size, with some few of them occasionally obsolete, but whatever the degree of obsolesence, the color of the wings is still *yellow*, and if all the markings were obliterated, would be *white*. A. S. Packard, jun., (Proc. Ent. Soc. Phil., vol. 3, p. 106,) after the examination of fifty specimens from Maryland, notes no other differences, except that in one specimen the black border of the secondaries sent large broad expansions towards the middle of the wing. (See also U. ornatrix and U. speciosa.)

2.—UTETHEISA SPECIOSA. (Pl. 2, fig. 16.)

Deiopeia speciosa, Walker, C. B. M. Lep. pl. 8, p. 568. (1854.)

Deiopeia speciosa, Clem., Syn. Lep. N. Am. app. p. 314. (1862.)

♂ . ♀ .—The foregoing description of U. bella, will do for the present species, except that where U. bella is yellow, U. speciosa is *red*, on the upper surface of the primaries, and on the thoracic parts. In one specimen before me, the abbreviated fifth band unites with the fourth, instead of the sixth transverse band.

Expanse of wings, 1.60 inches. *Length of body*, 0.65 inch.

Habitat.—Atlantic States and West Indies.

The specimen from which the figure was drawn, was forwarded to me with other insects from Massachusetts, by F. Sanborn, but its precise locality was not stated. Walker gives the West Indies as the locality from which the type of his species was received. The *red-winged* form seems indeed to be the one most prevalent among these islands, but I have yet to see anything which is intermediate in color between *U. bella* and *speciosa*.

3.—UTETHEISA ORNATRIX. (Pl. 2, fig. 18.)

Noctua ornatrix, Linn., Syst. Nat., p. 839. (1767.)

Noctua ornatrix, Drury, Exot., vol. 1, p. 51, pl. 24, fig. 2. (1770)

Bombyx ornatrix, Fabricius, Syst., Ent., p. 586. (1775.)

Phalæna ornatrix, Cramer, Exot., vol. 2, pp. 107–108, pl. 166, figs. C. D. F. (1779.)

Bombyx ornatrix, Fabr., Sp. Ins., vol. 2, p. 203. (1781.)

Bombyx ornatrix, Fabr., Mant. Ins., vol. 2, p. 131. (1787.)

Bombyx ornatrix, Fabr., Ent. Syst., vol. 3, p. 479. (1793.)

Utetheisa ornatrix, Hübner, Verz. Schmett, p. 168. (1868.)

Utetheisa ornatrix, Hübner, Samm. Exot. Schm., vol. 2, Lep. 3, Phal. 2, Ver. 4. (1806–1824.)

Deiopeia ornatrix, Westw. Ed. Drury, vol. 1, p. 46, pl. 24, fig. 2. (1837.)

Deiopeia ornatrix, Walker, C. B. M., Lep., pl. 8, p. 567. (1854.)
Grote, Proc. Ent. Soc. Phil., vol. 5, p. 234.

Expanse of wings, 1.70 inches. *Length of body*, 0.65 inch.

Habitat.—Texas, Mexico, West Indies.

♂. ♀.—Head, thorax and abdomen as in U. bella, except that the portions colored yellow in *U. bella*, are *vermillion* in *U. Ornatrix*.

Primaries *pale flesh color*, with minute black dots disposed as follows: one at the base of the median vein, one on the inner margin near the base, four on the costa, a sinuated subterminal band, and an outer series on the outer margin. Between the two terminal bands there is a narrow broken vermillion band, and the costa is narrowly edged with the same color between the black dots.

Secondaries, *white, subhyaline*, with marginal band and markings as in U. bella. Costa faintly tinged with pinkish.

Beneath, primaries deep red, costa yellowish, the black dots on the

costa, and the marginal bands seen above being more clearly indicated. Secondaries as above except that the costa is broadly pink, nearly concolorous with the primaries.

I have before me three specimens from Texas, and three from Mazatlan, in Mexico. The only variations to note on the primaries, are the presence in one specimen of what would be the subcostal spot of the short fifth band of U. bella; and in two specimens, of two interior subcostal spots of what corresponds to the fourth band in the same species. In two Mexican specimens the secondaries are largely clouded with black, and one Texan example has the costal two-thirds of the same wings, concolorous with the primaries. These variations do not, however, affect the distinctive character of the insects in which they occur.

Much may be said in favor of the view that the three foregoing species are merely geographical varieties of one and the same thing, and they are not here presented with perfect confidence that they are specifically distinct, but in the absence of all knowledge of their preparatory stages, and in view of their geographical distribution, the striking dissimilarity of their "fascies," and the difficulty of deciding which should be considered the type, I have presented them in this way, without wishing by so doing to pass upon the question of their specific identity.

The whole genus is one of very difficult determination. It seems to me that while U. bella may possibly be specifically distinct, there is a possibility that *speciosa* and *ornatrix* may merge by degrees one into the other, yet among all the specimens I have seen I have met with but one, which I could not immediately refer to one or other of the three species, if they are so considered. This specimen is from Porto Rico, W. I., and is figured on plate 2, fig. 17. The upper wings most nearly resemble U. speciosa, (plate 2, fig. 16,) while the secondaries are like those of U. ornatrix. It is the occurrence of individuals such as this which obscure the question. Grote, in speaking of U. bella from Cuba, (Proc. Ent. Soc. Phil., vol. 5, p. 235,) seems to me to have had before him specimens with reddish upper wings, which would place them under U. speciosa, *Walker*, and if we consider these to be identical with the typical yellow winged U. bella, the entire series must be united under one specific name (U. ornatrix), for *speciosa* and *ornatrix* (on account of the base of coloring of the primaries being red in both cases) are much more likely to be specifically identical than the yellow *bella* and flesh colored *ornatrix*. The strongest argument in favor of their specific

identity is to be found in the constancy of the coloring of the under surface of the primaries in all three varieties, and in the fact that however few of the black markings of the upper surface may be present, those that remain, even in *ornatrix,* occupy exactly the same position as the corresponding markings in full colored individuals. On the other hand *ornatrix* seems to be a Mexican type; *speciosa,* a West Indian type, and *bella,* a more northern type; and even in Texas, where both *ornatrix* and *bella* occur, the two insects retain their characteristic markings. A knowledge of their larval stage can alone decide this question satisfactorily.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **CALLIMORPHA**, Latreille.

"Fore wings usually with two subcosto-marginal nervules from the disc, and a costal cell formed by the second branch, sometimes much contracted and narrower and placed above the discal vein or exterior to the disc; in this case there is but one marginal nervule from the disc. The post-apical nervule arises either about midway between the end of the costal cell and the apical nervulet, or from the end of the cell. The subcosto-inferior and the discal arise at a common point, the latter curved. Median vein four-branched, (the origin of the first, second, and third branches close together and equidistant,) the posterior nervule remote from the penultimate branch. Hind wings broader than the fore wings; neuration arctiæform, the subcostal becoming furcate exterior to the origin of the discal vein. Primaries triangulate, twice as long as broad; costa slightly curved, apex square, hind angle slightly rounded.

"Head moderate, free, smooth; with ocelli. Face and vertex narrow. Eyes rather large and prominent; antennæ slender, filiform and ciliated in both sexes; labial palpi somewhat exceeding the clypeus, rather porrected but subascending, smooth, and towards the base pilose; the middle and basal joint nearly equal, the terminal joint quite short and ovate. Tongue as long, or nearly as long, as the thorax beneath.

"Body slender; thorax smooth; patagia cylindrical or revolute, scarcely ascending above the vertex and pilose; breast and abdomen smooth; legs rather slender, the tibial spur of the anterior concealed; hind tibiæ with four moderate spurs, longer than the hind femora."

Clemens, Proc. Acad. Nat. Sci. Phil., p. 535, 1860.

The American species of this genus are white or luteous, with brown markings, while the European forms, such as *hera* and *dominula* are ornamented with red and green. The three species found in our limits may be tabulated thus: (They all occur in the Atlantic States.)

* Posterior wings ocherous.

Anterior wings with white and brown markings - *C. clymene.*

" " with brown markings - *C. interrupto-manginata.*

* Posterior wings white.

Anterior wings white with brown markings - - *C. Lecontei.*

1.—**CALLIMORPHA LECONTEI.** (Pl. 2, figs. 20, 21.)

Callimorpha Lecontei, Boisd., Guerin, Icon. Regne An. Griffith's Cuv. An. Kingd., plate 32, fig. 4. (1831.)

Callimorpha militaris, Harris, Cat. Ins. Mass., p. 592. (1833.)

Callimorpha militaris, Harris, Rep. Ins. Mass., p. 243. (1841.)

Hypercompa Lecontei, Walk., Cat. Lep. B. M. III., p. 651. (1855.)

Callimorpha leucomelas, H. S., Lep. Exot., p. 17, fig. 431. (1855.)

Callimorpha Lecontei, H. S., Lep. Exot., p. 72. (1858.)

Hypercompa Lecontei, Clem., Proc. Acad. Nat. Sci. Phil., p. 536. (1860.)

Callimorpha militaris, Clem., Syn. Lep. N. Am. App., p. 345. (1862.)

Hypercompa Lecontei, Saunders, Syn. Can. Arct., p. 28. (1863.)

Var. *Hypercompa confinis*, Walk., Cat. Lep. B. M. III., p. 651. (1855.)

Hypercompa confinis, Clem., Proc. Acad. Nat. Sci. Phil., p. (1860.)

Hypercompa confinis, Clem., Syn. Lep. N. Am. App., p. 345. (1862.)

Hypercompa confinis, Saund., Syn. Can. Arct., p. 28. (1863.)

Var. *Hypercompa contigua*, Walk., Cat. Lep. B. M. III., p. 652. (1855.)

Hypercompa contigua, Clem., Proc. Acad. Nat. Sci. Phil., p. 536. (1860.)

Hypercompa contigua, Clem., Syn. Lep. N. Am. App., p. 346. (1862.)

Hypercompa contigua, Saund., Syn. Can. Arct., p. 26. (1863.)

Var. *Hypercompa fulvicosta*, Clem., Proc. Acad. Nat. Sci. Phil., p. 536. (1860.)

Hypercompa fulvicosta, Saund., Syn. Can. Arct., p. 26. (1863.)

Callimorpha vestalis, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 108. (1864.)

Tanada conscita, Walk., Cat. Lep. B. M. XXXII., p. 377. (1865.)

This insect, as the above synonomy will prove, is a most variable species. The variety which is figured as fig. 165 of the third edition of Harris' Ins. Inj. Veg., is taken as the type in the following description, it appearing to be a medium between the *Hypercompa confinis*,

Walker, in which the dark coloring most largely predominates, and the *Callimorpha vestalis*, Packard, where all the markings on the primaries are obsolete. This variety is the *Callimorpha militaris*, Harris, (plate 2, fig. 20.)

♂. ♀.—White and brown. Head fulvous; palpi fulvous; tips brown, Prothorax pale fulvous with two brown dots near the median line. Thorax brown, with two lateral white stripes. Abdomen whitish, with a narrow dorsal brown line. Thorax beneath pale fulvous, legs the same, outside of the tibiæ and femora of the two anterior pairs brown.

Anterior wings *white*, marked with brown. A brown stripe on the inner margin below the submedian vein, which throws off an oblique transverse band across the nervules, its inner edge terminating at the apex. Outer edge brown nearly to the anal angle, thus enclosing a large ovate patch of white, supplemented near the apex by a small white spot. Costa above the subcostal vein, brown nearly to the apex, with two angular projections directed backwards, one terminating at the origin of the first median nervule, the other about midway between it and the apex. There are generally corresponding, but less prominent projections, on the oblique band. Posterior wings white immaculate.

Beneath as above, except that the markings of the primaries are quite obscure, while the costa and apical portion of the oblique band have a yellowish tinge.

Expanse of wings, 1.80 inches. *Length of body*, 0.70 inch.

Habitat.—Canada and Eastern United States. Canada, (Saunders.) New York, (Edwards.) Mass., (Sanborn.) Delaware, (Doubleday.) St. Louis, (Agassiz.) (Coll. generally.)

Considering this form (pl. 2, fig. 20,) as the type, all the other modifications can be derived from it, either by the expansion and confluence of the brown markings, or by their obsolescence being more or less complete. In *C. fulvicosta*, Clemens, the markings are all obliterated on the anterior wings. Plate 2, fig. 21 shows a variety in which the oblique band only is obliterated. By the union of the toothed projections of the brown costal margin with those of the oblique band, the wings become five-spotted and we have *C. Lecontei*, Boisduval. By continuing this expansion of the brown markings we get successively *C. contigua* and *C. confinis* of Walker. Not having seen the two last mentioned varieties, I have included them as synonyms on the authority of Grote, who has compared the originals in the British Museum, (Trans. Am. Ent. Soc., vol. 2, p. 72.) Some forms here classified as vari-

eties may prove to be valid species when their history is known, as, for instance, *C. contigua*, which is stated by the editor of the *Canadian Entomologist*, (vol. 1, p. 45,) to be quite a constant form. For convenience of reference, the following references to the markings of the different varieties are added:

C. contigua, Walker, "Primaries brown, with a white discal stripe which widens from the base to a little beyond the middle, and with two large subapical white spots. Secondaries with a small brown spot near the hind border."

C. confinis, Walker, "Primaries brown, with a discal, slightly angular white stripe, and an elongate triangular oblique subapical white band."

C. fulvicosta, Clemens, of which *C. vestalis*, Packard, is only a synonym, "White, palpi orange yellow, tips blackish. Head, prothorax and anterior edge of fore wings, especially beneath, orange yellow. Sometimes the costa of the fore wings is dark brownish. Breast and legs orange yellow, the middle of fore tibiæ and tarsi blackish. Abdomen tipped with yellowish orange."

Larva; C. Lecontei.—Mr. Saunders succeeded in rearing four specimens, which he states resembled each other very closely, but does not give the name of the variety produced. The larvæ were found June 10, feeding on horse gentian, *(Triosteum perfoliatum);* they entered the chrysalis state June 19–20, and produced the imago July 12–14. The following is his description of the larva:

"Length 1.10 inches, nearly cylindrical. Head rather small, bilobed, black and shining, with a few short hairs, mandibles black, palpi pale brown tipped with black.

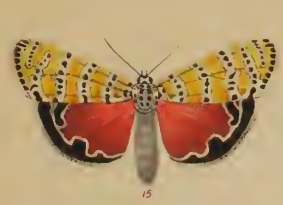
"Body above black, with transverse rows of elevated shining black tubercles, from each of which arises a spreading tuft of short bristly hairs, a bright yellow dorsal stripe, and a wide band of the same color on each side, this latter intersected with streaks and centered with a broken band of black; about half way between the dorsal and lateral stripes, is a row of pale whitish dots, forming a faint broken line.

"Under surface dirty greyish white, with streaks and dots of brown, feet black, prolegs dirty white on inside, with a patch of shining black on the outside of each." *Canadian Entomologist*, vol. 1, p. 20.

Larva; C. fulvicosta.—Figured by Riley in 3rd Ann. Rep. St. Ent. Missouri, p. 132, fig. 56, A. B. C., the following description being copied from the same work on p. 134: "Color velvety black above, pale

EXPLANATION OF PLATE 2.

1.—Gnophæla vermiculata, Grote - - Colorado.
2.— " Hopfferi, Grote - - - California.
3.—Lycomorpha pholus, Harris - - Atlantic States.
4.—Anatolmis Grotei, Packard - - - Colorado.
5.—Kodiosoma tricolor, Stretch, N. S. - Nevada.
6.— " Eavesii, Stretch, N. S. - - "
7.— " fulva, Stretch, N. S. - - California.
8.— " nigra, Stretch, N. S. - - "
9.—Euphanessa mendica, Packard - - Atlantic States.
10.—Cisthene faustinula, Stretch - - - California.
11.— " nexa, Stretch - - - "
12.—Hypoprepia fucosa, Hübner - - - Atlantic States.
13.—Clemensia albata, Packard - "
14.—Pyromorpha dimidiata, H. S. - - "
15.—Utetheisa bella, Linn - - - "
16.— " speciosa, Walker - - - "
17.— " ? - - - - W. Indies.
18.— " ornatrix, Linn - - - Texas.
19.—Callimorpha interrupto-marginata, De Beauv Atlantic States.
20.— " Lecontei, Boisduval - - "
21.— " " Boisduval - - "


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bluish gray speckled with black below; a deep orange medio-dorsal line (usually obsolete towards each end), and a more distinct, wavy, broken, yellow stigmatal line, with a less distinct coincident pale line below it. Covered with large, highly polished, roughened, deep steel-blue warts, the irregularities of which as they catch and reflect the light, look like pale blue diamonds. Closely examined these warts are found to be covered with small elevations, each of which furnishes a short stiff yellow hair, these hairs radiating in all directions around the warts which are placed as follows: joint 1, with an anterior transverse row of eight, and a posterior dorsal row of four; joints 2 and 3 each with a transverse row of eight across the middle; joints 4–11 inclusive, each with four circular ones anteriorly, and two irregular ones posteriorly on dorsum (each of the last evidently formed by the blending of two), and two on each side near the middle of the joint; joint 12 with two that are irregular on the back, and one that is circular on each side. Anal shield formed of one large irregular wart. In addition to these there is a narrow subventral wart on each side, and two large ventral ones on each of the legless joints. Head polished black with a few black hairs. Thoracic legs polished black, but pale at the joints inside; prolegs black outside, flesh colored within and at extremities. Stigmata not perceptible. Largest in the middle of the body. Average length 0.90, greatest diameter 0.15 inch."

"Described from six peach-feeding specimens. Alcoholic specimens do not reflect the pale blue points."

From the above descriptions it will be seen that the larva of *C. Lecontei* differs principally from that of *C. fulvicosta*, in lacking the blue reflections and in having a pale dotted subdorsal line.

Pupa.—The larva of *C. fulvicosta* is said by Riley to spin a slight cocoon of white silk, changing to a pupa of a purple brown color, finely and thinly punctured and terminating in a horizontally flattened plate, which is furnished with numerous yellowish brown curled bristles. The moth issues from this chrysalis during the fore part of June.

Though *C. fulvicosta* has been found feeding on the peach tree, it does not occur in sufficient abundance to be a serious pest to the orchard.

2.—CALLIMORPHA INTERRUPTO-MARGINATA. (Plate 2, fig. 19.)

Bombix interrupto-marginata, De Beauvois, "Ins. Afriq. et Amer., p. 265, pl. 24, figs. 5, 6." (1805.)

Callimorpha anchora, Harris, (M. S. figs.)

Hypercompa comma, Walker, C. B. M. Lep. III., p. 652. (1855.)

Hypercompa interrupto-marginata, Clem., Proc. Acad. Nat. Sci. Phil., p. 161, 536. (1860.)

Callimorpha comma, Morr., Syn. Lep. N. Am. supp., p. 346. (1862.)

♂. ♀.—Whitish, brown, and fulvous. Head whitish, front and vertex fulvous. Palpi yellowish, apical joint dark brown. Patagia and thorax whitish, the latter with a broad longitudinal median stripe. Abdomen yellowish, with a faint dorsal dark line, most distinct at the base. Thorax beneath, and legs fulvous, the anterior pair dark brown outwardly.

Anterior wings whitish, very faintly tinged with fulvous, which color is most intense on the costa at the apex. The costa above the subcostal vein, is brown nearly to the apex; the outer margin from the apex to the fourth median nervule is also brown, as is also the inner margin from the base to the anal angle. This last brown patch does not unite with the one on the outer margin, extends above the internal vein, and throws off a quadrate expansion towards the centre of the wing, terminating on the second median nervule.

Posterior wings clear ochre-yellow, with a sub-cordate brown spot near the outer margin, and rather nearer to the anal than to the apical angle. Beneath all the wings concolorous with the secondaries; the spot on which is reproduced, but divided into two by the yellow vein. On the primaries the spots are obsolete, except that portion of the brown internal margin which is thrown off towards the disc of the wing, and that portion which lies between this expansion and the inner angle.

Expanse of wings, 1.70 inches. *Length of body*, 0.65 inch.

Habitat.—Northern Atlantic States and Canada. Connecticut, (Coll. Harris.) Massachusetts, (Trouvelot.) New York, (Grote.) St. Catherine, C. W., (Coll. Scudder.) Wisconsin and Virginia, (Clemens.)

BOMBYCIDÆ.

ARCTIINÆ.

Genus **KODIOSOMA**, N. G.* Stretch.

Head small, hairy, somewhat sunk in the thorax. Antennæ moderately long, pectinated. Palpi stout, very hairy, pendent, but very slightly advanced beyond the front. Thorax broad and stout, very hairy as are also the patagia. Abdomen stout, hairy, extending beyond the hind wings, tufted at the tip and sides. Legs stout, smoothly scaled. Wings subdiaphanous, thinly scaled, twice as long as broad, costa straight, outer margin rounded, inner angle rounded; posterior wings two-thirds as long as the anterior wings, not reaching to the tip of the abdomen. Size small, color generally black.

This genus comes near to Phragmatobia. Having only unique specimens of each of the four species enumerated, I am unable to give the neuration, as the small size of the insects precludes the possibility of making it out without destroying the specimens. This meagre description must therefore stand until more material occurs. It is drawn up from the typical species *fulva* and *nigra;* the other two species are retained in the genus provisionally.

1.—KODIOSOMA FULVA, N. S. (Pl. 2, fig. 7.)

Head black, hairy. Palpi stout, black, tips paler, hairy, pendent, scarcely visible beyond the front. Antennæ black. Prothorax hairy, pale buff. Patagia long, narrow, clothed with long fine black hairs, as is also the thorax. Legs long, slender, black inside, white outside. Abdomen stout, broad, depressed, clothed with long silky black hairs above, slightly mingled with buff. Tip prominently buff; beneath paler.

Anterior wings long, narrow; costa straight, slightly rounded at tip; outer margin rounded, nearly equal in length to the inner margin; inner margin straight, nearly parallel with the costa. Color smoky black, subdiaphanous, thinly scaled, with the base and margins of the wing slightly darker than the disc. Costa margined narrowly with buff.

* *Kodion*, small fleece; *Soma*, body; in allusion to the soft fleecy-looking body parts.

A narrow, transverse, pale buff line, somewhat beyond the middle, angulated inwardly, and scarcely reaching the costa. Fringes short, pale buff.

Posterior wings subdiaphanous, pale buff, outer third smoky black, narrowest at the anal angle. Inner margin clothed with long pale buff hairs.

Beneath as above, but much paler.

Expanse of wings, 0.90 inch. *Length of body*, 0.30 inch.

Habitat.—California, (Coll. Henry Edwards.)

Described from two specimens taken in the vicinity of San Francisco, by my friend H. Edwards, one at San Mateo and the other at Saucelito, both flying during the day time.

2.—KODIOSOMA NIGRA, N. S. (Pl. 2, fig. 8.)

Head, antennæ, palpi thorax and legs black. Prothorax pale yellow. Abdomen black with anal tuft yellow. All of the body parts stoutly built and very hairy.

All the wings smoky black, thinly scaled, subdiaphanous, color most intense at the base, and on all the margins. Costa of the anterior wings very narrowly edged with yellow, there being as well, on the same wings, a faint, *straight*, oblique, transverse, narrow, yellowish band beyond the middle. Posterior wings immaculate. Fringes black.

Expanse of wings, 0.85 inch. *Length of body*. 0.30 inch.

Habitat.—California, (Coll. Dr. Behr.)

Described from a single specimen raised from a larva found in May in Marin county. Dr. Behr states that the larva bore a striking resemblance to that of Syntomis and the cocoon to that of Halesidota, but is unable to give the characters of the larva more in detail, as it changed to the pupa immediately after it was found. The anterior wings have the costa and inner margin more parallel, and the apex of the wing more quadrate, than in the other species of the genus.

3.—KODIOSOMA TRICOLOR, N. S. (Pl. 2, fig. 5.)

♂.—Head black. Palpi black, hairy, pendent, only slightly advanced beyond the front. Prothorax white, clothed with evenly cut hairs. Patagia large, black; thorax black, both it and the patagia being covered with short fine hairs. Legs slender, smooth, black. Abdomen

broad, stout, abruptly pointed, clothed with short hairs, black beneath, red above, the tip black, and the base clouded with black, with an indistinct dorsal line of the same color. Tip slightly tufted.

Anterior wings long and narrow; costa straight, rounded at the apex; outer margin nearly equal to the inner margin, slightly convex; inner margin straight. Color uniform dull greenish black, with a narrow, transverse, white band beyond the middle, bent outward on the costa. Base of the costa narrowly edged with whitish. Fringes whitish.

Posterior wings clear red, with a black band on the outer margin, gradually tapering in width to the anal angle. Costa blackish. Fringes black.

Beneath as above, except that the colors are paler, the transverse band more diffuse, and the base of the costa whitish on both wings.

Expanse of wings, 1.00 inch. *Length of body*, 0.40 inch.

Habitat.—Nevada, (Coll. Dr. Behr.)

Described from a single specimen taken in May, at Carson City, Nev., flying in the afternoon over low herbage. The flight strongly resembled that of *Zygæna filipendulæ*.

4.—KODIOSOMA EAVESII, N. S. (Pl. 2, fig. 6.)

Head, palpi, antennæ, thorax, legs and abdomen black, the latter sharply truncated. Prothorax dirty white, clothed with short hairs.

Anterior wings, with the apex, prominent, and the outer margin rounded to the inner angle. Color smoky black, deepest on the costa, apex and base; subhyaline on the outer half, and crossed by a narrowish, whitish band, originating nearly at the inner angle, and extending to the costa, where it encloses a black dot. This band is somewhat angulate inwardly. Fringes black.

Posterior wings smoky black, deepest at the base, subhyaline on the outer half. Beneath as above, except that the anterior wings are whitish at the base.

Expanse of wings, 0.90 inch. *Length of body*, 0.40 inch.

Habitat.—Nevada, (Coll. R. H. Stretch.)

Described from a single specimen taken near Virginia City, Nevada, by Mr. William Eaves of that place. This species approaches *K. tricolor* much more closely than the two Californian species, inasmuch as the body parts are clothed with much shorter hairs, and the whole appearance of the insect is less *woolly*. Of its habits I can add nothing.

BOMBYCIDÆ.

ARCTIINÆ.

Genus EPICALLIA, Hübner.

Antennæ moderate, subsimple in both sexes, (E. virginalis) or slightly pectinate in ♂ (E. villica.) Palpi porrect, slightly pendent, somewhat exceeding the front, finely scaled. Head clothed with short hairs. Thorax and abdomen finely scaled, the latter as long as or exceeding the hind wings. Wings ample. Primaries triangular to subovate. Costa straight, slightly curved at the apex, outer margin only slightly oblique. Secondaries large. Primaries *spotted*, neuration similar to Euprepia.

Larva clothed with very long silky hair similar to Euprepia.

This genus is allied, by its antennæ and fine scales on the body parts, to Callimorpha on one hand, and by its neuration and preparatory stages to Euprepia on the other. In its style of coloration it differs widely from the last genus which shows a strong approach in this respect to Arctia. But one species is found in the United States, and this, in many of its characters, such as the simple antennæ and finer scales of the entire insect, shows a departure from the European type, which, as pointed out by Packard, appears to be influenced by its association with the woolly European genus, while the American form conforms more to the finely scaled American genera Callimorpha, Euchætes, Ecpantheria and Halisidota.

1.—EPICALLIA VIRGINALIS. (Pl. 3, figs. 2, 3, 4. Pl. 10, fig. 1, *Larva.*)

Chelonia virginalis, Boisd., Lep. Cal., p. 49. (1852.)
Arctia virginalis, Walk., Cat. Lep. B. M., pl. 3, p. 611. (1855.)
Arctia virginalis, Morris, Syn. Lep. N. Am., p. 337. (1862.)
Epicallia virginalis, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 108. (1864.)
Epicallia virginalis, Grote, Trans. Am. Ent. Soc., vol. 1, p. 333. (Pl. 6, fig. 42, ♂. (1867–8.)

Var. *Agarista guttata*, Boisd., Lep. Cal., p. 48. (1852.)
Pleretes guttata, H. S., Lep. Exot., pp. 72, 83, fig. 464. (1858.)
Alypia guttata, Morris, Syn. Lep. N. Am., p. 132. (1862.)
Epicallia guttata, Grote, Trans. Am. Ent. Soc., vol. 1, p. 334. (1868.)
Callimorpha guttata, Boisd., Lep. Cal., p. 74. (1868–9.)

♂. ♀.—*Type*, black with yellow and ochraceous spots. Head bright reddish ochre. Palpi and antennæ black, the former reddish ochre beneath. Prothorax black with a small sulphur yellow spot on each side. Patagia sulphur yellow, edged with black. Thorax black with a small reddish ochre spot behind. Legs black, inside of anterior and middle pairs largely red ochre. Apical half of posterior tibiæ yellow, which prevails also largely on tarsi. Abdomen black above and below, with the tip, and indications at the sides of each segment, of narrow transverse bands of reddish ochre.

Anterior wings deep velvety black, with twenty to twenty-two clear yellow spots, disposed as follows: five at the base of the wing, (being two above the subcostal vein, two below the median vein, and one in the discal area); a double spot on the middle of the costa; beyond this, across the nervules, an oblique band of four unequal ovate spots, divided, by the black nervules; between these and the inner margin are two rounded spots; finally the nervules are crossed by an outer sinuated band of eight spots, those next the costa being very minute. Between the two middle spots of the four which lie below the median vein, there is frequently present a narrow transverse spot.

Posterior wings black, with reddish ochre markings as follows: an irregular median band broken in the middle, connecting on the costa with an inner transverse spot; faint indications of two or three basal spots, and an outer band of spots touching the anal angle where the spots are confluent.

Var. *ochracea*, (pl. 3, fig. 2,) differs in the color of the abdomen, and under wings, which are clear yellow ochre. The abdomen is black below, ochreous above, with narrow transverse black bands, sometimes more or less confluent at the base. On the posterior wings the black area is reduced to a submedian band, a transverse spot on the costa, an extra median band deeply emarginate in the middle, and traces near the apex of a black marginal band. The main nervules are frequently black in the outer portion of the wings. Var. *guttata* (pl. 3, fig. 3), resembles the type, except that the abdomen is entirely black, except the tip; and the secondaries are uniform black, except a few small reddish ochre spots, variable in number, near the outer margin, which are all that remain of the typical markings.

Expanse of wings, 2.20 inches. *Length of body*, 0.90 inch.

Habitat.—California, (Coll. Edwards, Behr, etc.)

Larva.—The body is black; the first three segments are clothed with dense rust-red hairs; the remaining segments with very long silky white

hairs, mingled with black along the sides, and a few rusty hairs on the segment, (anal, pl. 10, fig. 1.) It feeds on the various species of lupin, is full fed about the middle of July, and spins an irregular, thin open cocoon, composed entirely of white silk without intermixture of the hairs from the body. The imago appears in August and flies readily in the day time. Its flight is strong and rapid, making it a difficult insect to take on the wing.

This species is abundant in the neighborhood of San Francisco, (though extremely subject to the attacks of ichneumons of a variety of species) and also at Washoe Valley in the State of Nevada; probably also in many other localities where its favorite food-plants are found. It is liable to many variations, as is the case with many species of this sub-family. I have given *E. guttata* as a synonym after careful examination of a large number of specimens, being unable to draw the line of distinction. They have been separated on the differences of coloration of the posterior wings, yet in a long series it is possible to find specimens of every intermediate gradation of color, while if extreme types are selected, there ought to be three instead of only two species. The specimen figured on plate 6 of vol. 1 of the Trans. Am. Ent. Soc. is evidently the intermediate form, in which the fulvous and black of the lower wings are nearly equally divided, the abdomen being black above, with traces of fulvous bands across the sides. This may be considered the type, although Boisduval appears to have had before him, when he drew his description, the second variety, in which the fulvous coloration largely predominates, the black being much reduced in area, and the abdomen banded above with fulvous, thus giving the insect a paler and distinct appearance. The third variety *(E. guttata)* has the lower wings almost entirely black, only a few small spots remaining of the fulvous coloring.

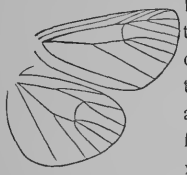
Now from larvæ collected on the same spot and at the same time, I have raised both ♂ and ♀ of varieties 1 and 2, without being able to detect any differences in the larvæ, and my friend Henry Edwards, of San Francisco, has collected varieties 1, 2 and 3 in Nevada, on the same ground and at the same time, and assures me that he has never been able to detect more than one type of larva on the locality where these were taken. It follows then, that while the absolute identity of varieties 2 and 3 is not yet fully established, the fact is proven as regards 1 and 2, which differ equally widely, and all the evidence is in favor of their being merely varieties of the same insect. The gradation of coloration is in favor of this view, although it is by no means difficult to segregate a number of specimens into the respective varieties with tolerable certainty.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **ARCTIA.** Schrank.

Fore wings with the subcostal nervure having two marginal nervules from near the end of the cell, and with a long narrow costal cell formed between the second marginal and subcostal vein, and extended a little beyond the origin of the post-apical, or without this cell. The subcosto inferior nervule and the discal vein arise at a common point, and toward the apical portion of the wing is given off the post-apical and apical nervules. The median vein is four-branched, the posterior nervule being very remote from the others. Hind wings broader than the fore wings, as long or rather longer; neuration as usual in the family.



Head small, rather sunken in thorax, hairy, and with ocelli. Front narrow and hairy. Eyes small. Antennæ in the ♂ shortly pectinated, in the ♀ serrated, and sometimes slightly pectinated. Labial palpi porrected, hairy and exceeding the clypeus by about one half their length; the third joint subacute, nearly or quite as long as the second joint. Tongue with slender filaments, as long as the anterior coxæ.

Body thick. Thorax covered with thick hair. Patagia rather large, more or less overreaching the vertex. Breast rather hairy. Legs rather stout, with all the femora hairy. Anterior tibiæ longer than the last joint of tarsus, with tibial spur concealed; the posterior tibiæ having four moderate spurs.

Clemens, Proc. Acad. Nat. Sci. Phil., p. 526. (1860.)

The tabulation of the species of this genus is a most difficult task. The following attempt will, however, be some assistance in limiting the researches of the student :

a. Primaries dark.
 b. Nervules clothed with pale scales.
 c. Secondaries crimson - *Virgo, Saundersii, Achaia,* ♂.
 cc. " black - - - - - - *Anna.*
 ccc. " yellow.
 † Transverse bands on primaries - *Persephone, Achaia* ♂. Var. *Ochracea.*
 † No transverse band on primaries - - *Virguncula.*
 cccc. Secondaries reddish ochre or brick red - *Dahurica, Achaia* ♀, *Edwardsii, Complicata.*
 ccccc. Secondaries cinereous - - *Speciossima, Quenselii.*
 b. Nervules concolorous with the rest of wing.
 c. Thorax black, - - - - *Behrii Nevadensis.*
 cc. " striped.
 d. Primaries with longitudinal stripes only.
 * Secondaries red or reddish - *Nais,* var.; *Nais,* var. *decorata.*
 * Secondaries buff - - - - - - *Nais.*
 dd. Primaries with longitudinal and transverse stripes, markings narrow.
 * Secondaries red - - *Williamsii, Bolanderi, figurata.*
 * " yellow and brown - - *figurata,* var. *celia.*
 ddd. Primaries with longitudinal and transverse stripes, markings broad, giving the wings an angular-spotted appearance.
 * Secondaries red or reddish - *autholea* ♀, *Blakei.*
 * " white - - - - *autholea* ♂.
 * " cinereous - - - - - *gelida.*
A. Primaries pale - - - - *arge, placentia, pallida.*

1.—ARCTIA AUTHOLEA. (Pl 3, fig. 3 ♂, 4 ♀.)

Chelonia autholea, Boisd., Lep. Cal., p. 76. (1868-9.)

♂.—Very pale yellowish white. Head and prothorax pale yellowish. Patagia and thorax of the same color, with a broad black stripe down the centre of each. Abdomen rosy red, with the last segment, and a dorsal row of small spots black.

Anterior wings pale yellowish, with black spots disposed as follows: two basal longitudinal ones; two sub-quadrate ones on the costa, followed by a triangular one near the apex, and a small sublunate one at the extreme apex. A triangular spot on the middle of the outer margin with its base outward, and two others between it and the anal angle with their bases inwards. The first quadrate costal spot has a small portion detached by the light median vein, and opposite it near the inner margin is another sub-quadrate spot. Between the second quadrate costal spot and the inner margin, are two very narrow transverse spots. Fringes and all the margins of the wings narrowly and neatly yellowish. Posterior wings white, with the inner margins rosy red.

♀.—Similar to the ♂ except that the black on the abdomen is more prominent, and the lower wings are *entirely* rosy red, with a faint discal and an outer band of four black spots, of which three are subcordate with the points outward, the fourth, (being the second from the apex) triangular with the base outward. Fringes pale rosy red.

Expanse of wings, 1.70 inches. *Length of body*, 0.70 inch.

Habitat.—California, (Coll. H. Edwards.)

Of this handsome and characteristic species I have seen but one ♂ ♀, both to taken in southern California. While Boisduval's description is somewhat vague as to the markings of the primaries, which in this genus are notoriously difficult to describe in words; the words "lower wings white, with the abdominal gutter red," and his reference to the red secondaries of the ♀, satisfy me that the insect here figured is the same described by that writer, who states that he has received the male also from Mexico.

2.—ARCTIA BEHRII N. S. (Pl. 3, fig. 12 ♂, 11 ♀.)

♂.—Head, thorax, patagia and abdomen below black. Abdomen above pale orange, with the terminal segment, and a dorsal row of transverse spots black.

Anterior wings velvety black, marked as follows with pale ochraceous yellow: a narrow longitudinal streak reaching nearly to the outer margin, between the median and internal veins, and a narrow edging to the inner margin. A *broad* basal band, and two submedian bands reaching from the costa to the inner margin where they nearly unite. In addition there is the usual outer angulated band, originating on the costa, midway between the outer band and the apex of the wing.

Its first angle scarcely reaches the outer margin ; its second rests on the outer band, enclosing a large transverse black spot; its third touches the outer margin but does not connect with the longitudinal streak. The costal spot at the base is divided by a short oblique transverse band. Fringes blackish.

Posterior wings rose, inclining to orange. A small black spot on the costa beyond the middle, and a marginal row of five black spots the first apical, the other three triangular with their bases inward, and apices not reaching the margin of the wing. Fringes concolorous with the adjacent parts of the wing. Beneath, all the wings are as above except that the coloring is less intense.

♀.—Similar to the ♂ except that the basal band is narrower, and the median bands are sharply angulated near the costa, and continued along it slightly towards the base of the wing. The longitudinal streak does not extend beyond the outer median band, but reappears near the outer margin connected with the angulate band. Fringes black, interrupted with yellowish. On the secondaries the apical and third black spot are united and merged into a narrow black margin. Fringes black at the apex only.

Expanse of wings, ♂ 1.70, ♀ 1.40-1.70 inches. *Length of body*, 0.70 inch.

Habitat.—Downieville, California, (Coll. Dr. Behr.)

This fine species I have named with much pleasure after Dr. Behr of San Francisco, whose extensive collection containing many novelties collected during a long residence on the Pacific Coast, has been generously placed at my disposal for the purposes of this work. A. Behrii may be readily distinguished from its congeners by the black head and thorax, which impart to it a most distinctive character. In this respect it resembles A. Nevadensis, *Grote*. Two ♂ ♀ examined, showed no tendency to variability.

3.—ARCTIA BOLANDERI, N. S. (Pl. 3, fig. 13.)

♂.—Anterior wings deep blackish brown ; costa and inner margin narrowly edged with yellowish ; fringes the same color. The anterior wings are marked as follows with dirty yellow : A narrow streak between the median and internal veins reaching nearly to the outer margin. A small spot on the costa indicative of an obsolete basal band, and two narrow transverse bands, divergent on the costa, but meeting on the longitudinal streak and continuing thence as one to

the inner margin. Outside of this is the usual angulated line, resembling the letter z, originating on the costa midway between the outer transverse band and the apex. Its first angle is somewhat distant from the outer margin, its second rests on the outer median band, while the third nearly touches the outer margin but does not connect with the longitudinal streak.

Posterior wings rose color, with the outer margin from the apex to near the anal angle, narrowly banded with black, the inner line being sinuated. Just inside of this are three small black spots. Fringes yellowish. Beneath the anterior wings are paler, with the yellow markings broader and less clearly defined; the posterior wings are more inclined to orange, with indications of one or two discal dots, in addition to the markings seen above.

The condition of the body parts of the only specimen I have seen, is such as to preclude an accurate description.

Expanse of wings, 1.00 inch. *Length of body*, 0.40 inch.

Habitat.—California, (Collection of Dr. Behr, from Mt. Shasta.)

This well marked species is probably the smallest of the North American Arctians. I have named it after Professor Bolander of San Francisco, who, though more specially devoted to botanical studies, and eminent therein, has greatly aided our knowledge of California Entomology by collecting insects during his botanical rambles in the remote districts of the State. The present species was taken by him.

4.—ARCTIA EDWARDSII, N. S. (Pl. 3, fig. 9.)

♂.—Head prothorax and patagia pale ochreous yellow, with two black spots on the prothorax, and a black dash in the centre of the patagia. Thorax black, with two narrow pale ochreous stripes. Abdomen dirty red above, pale ochreous below, with the terminal segment and base black, and a dorsal, lateral, and two ventral rows of black spots. Legs black, outside of tibiæ yellowish.

Anterior wings black, with the costa, inner margin and veins, very narrowly pale ochreous, and the following markings of the same color. A narrow longitudinal streak below the median vein, forking on the outer margin; a transverse basal band slightly curved outwardly, and beyond this a bifurcate median band originating on the inner margin, with both branches slightly convex outwardly, and diverging towards the costa in the form of the *letter V;* beyond this an angulated outer

band, one extremity resting on the costa, the other upon the upper fork of the longitudinal streak, and its centre on the median band. Inside the basal band is a small band reaching from the costa to the longitudinal streak. Fringes yellowish.

Posterior wings red, inclining to orange, blackish at the base and along the basal half of the inner margin, with a narrow black outer margin toothed between the black spots, which are arranged as follows, being seven in number: one at the base, one on the inner margin, two near the costa, and three adjacent to the outer margin. Fringes yellowish.

Beneath, the anterior wings are marked as above, but the colors are paler, the bands more diffuse, and the veins yellow only at the outer margin. The posterior wings are more inclined to orange and show in addition three small black spots on the costa.

Expanse of wings, 1.40 inches. *Length of body*, 0.55 inch.

Habitat.—San Francisco, California, (Coll. R. H. Stretch.)

Allied to A. Dahurica, *Boisd.*, from which it may be readily distinguished by the rounded apex of the anterior wings, (these being acute in A. Dahurica) and the distinct V-shaped form of the median bands. I have seen but one specimen and in this the antennæ are wanting.

5.—ARCTIA DAHURICA. (Pl. 3, fig. 10, ♀.)

Chelonia dahurica, Boisd., Icon. Hist. Lep. 126, 2 fig. 1. (1832.)

Chelonia dahurica, H. S. Samm. Eur. Sch. Band. II, p. 145. (1845.)

Chelonia dahurica, Boisd., Lep. Cal., p. 48. (1852.)

Arctia dahurica, Walker, C. B. M. Lep. Het. p. 3, pt. 597. (1855.)

Arctia dahurica, Clemens, Proc. Acad. Nat. Sci. Phil., p. 527. (1860.)

Arctia dahurica, Morris, Syn. Lep. N. Am., p. 341. (1862.)

Arctia dahurica, Packard, Proc. Ent. Soc. Phil., p. 118. (1864.)

Arctia dahurica, Grote, Trans. Am. Ent. Soc., vol. 1, p. 336, pl. 6, fig. 41. (1868.)

"♂.—Head, pectus and labial palpi brownish; behind the antennæ are ochreous scales; antennæ black, finely bipectinate. Prothoracic pieces black, edged with ochreous hairs. Thorax black. Patagia black, fringed with ochreous. Thoracic parts, beneath, clothed with long brownish black squamation. All the tibiæ are pale ochreous outwardly, as are the hind tarsi, while the anterior femora are also

partially ochreous toward the lower end of the joint; elsewhere the legs are black or blackish. Abdomen, at base and dorsally, black, laterally bright ochreous; a segmentary series of black stigmatal spots. Beneath pale ochreous with sublateral series of broad segmentary maculations diminishing towards the anus.

"Anterior wings somewhat produced at apices, black. Costal edge, towards the base, pale ochreous. Nervules finely marked by pale ochreous scales. An incomplete sub-basal transverse band and an outwardly arcuate median band, not extending below the internal nervure. A longitudinal stripe running from the base below the median nervure outwardly to internal angle, before which it is furcate on cell 1 b; on this stripe rests terminally a series of transverse bands, resembling the letter K, with the straight stroke turned towards the base of the wing and the fusion of the bands (sometimes) obsolete on cell 3. The short fringes are pale yellow, and extend uninterruptedly from the apices over the rounded internal angle along internal margin. Beneath the wing is paler, while the markings of the upper surface are repeated, but less distinctly; the veins are obsoletely marked with pale scales. Secondaries largely black; subterminally these show irregularly shaped and elongated bright ochreous patches; fringes as on primaries. Beneath the secondaries are largely marked with bright ochreous bands on a black ground." (Grote, loc. cit.)

♀.—Same as ♂ except in the smaller amount of black on the secondaries, where the black spots are not confluent as in the ♂, but are distributed as follows: one at the base, a median row of three spots, an outer row of the same number, one of them touching the anal angle, and a black outer margin dentate between the outer row of spots.

Expanse of wings, ♂ 1.34, ♀ 1.60 inches. *Length of body*, ♂ 0.55, ♀ 0.60 inch.

Habitat.—California, (Coll. Boisduval, Edwards, Stretch.)

This insect is found in the neighbourhood of San Francisco, but appears to be rare. Dr. Boisduval states that the type of this species was received from Siberia, but is inclined to the opinion that this locality may be erroneous, as Eschscholtz from whom he received it, collected also in Russian America on the Alentian Islands, and may have taken it in the latter place.

Arctia complicata, Walker, from Vancouver's Island, appears to be a very closely allied species, even if it be not identical with A. Dahurica;

indeed it is quite possible that the figure here given of A. Dahurica may be the ♀ of Walker's *complicata*. As points of specific difference, Grote, who has examined Walker's type in the British Museum, notes a slight difference in the coloration of the head, a larger amount of pale color in the posterior wings, and the completeness of the terminal arctian band on the primaries, which in Grote's description of A. Dahurica is said to be obsolete on cell 3 (Q. v.) There is no note of any difference in the *location* of the markings on the primaries. Now both of these species are from the same locality, and in a genus where the markings are so notoriously liable to fusion or obsolescence it seems to me, (without having seen the type of *complicata*) that these differences are not sufficient to warrant the creation of a new species. As will appear in Part 5, *A. achaia* varies infinitely more than this, as do many other insects of this group found on the Pacific Coast, among which may be enumerated Antarctia vagans, (*punctata*, Packard), Pseudohazis eglanterina, Nemeophila alaskensis and Nemeophila———? Of the latter insect, one of the synonyms of which is *Lithosia decia*, Boisd., scarcely any two specimens are exactly alike, and it is quite common from California to Oregon. This extreme tendency to variation on the Pacific Coast is a subject of very great interest, whether due to the great variety of climate and conditions under which the insects live, or to whatever other cause, and being so constantly reminded of the fact I should greatly hesitate to separate two insects on differences so slight as those quoted by Mr. Grote. Indeed were I to do so it would be necessary to make four or five species of what I *know* to be Arctia achaia, Grote; and two, if not three, out of Pseudohazis eglanterina. I therefore, while not including *A. complicata* in the synonymy of *A. dahurica*, have but little doubt that the two insects are identical.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **SEIARCTIA.** Packard.

"Owing to the fine powdery scales that cover the body, the head seems much freer from the thorax than in Arctia. The front is broader throughout, more convex, where in Arctia it narrows towards the front edge, and becomes flattened. Palpi porrect, large and long, tips obtuse, surpassing the front by the entire length of the third joint. In Arctia the palpi do not reach beyond the front.

"Thorax moderately stout, finely scaled. Primaries long and narrow, the breadth being contained two and one-half times in the length. Costa straight on the basal half, from thence more convex than in A. Arge. The apex is produced more than usual, obtusely pointed. Outer edge very oblique, one-half as long as the costa, and nearly equals the length of the inner edge. In the neuration this genus is more like that of Halesidota that Arctia, since the second and third subcostals are curved very near the costa. Apical interspace much larger than in Arctia, while the fifth subcostal is longer and straighter, as are the three first median nervules, the third being curved more, while the semi-ovate space enclosed between the first and third is longer and broader towards the apex than in Arctia, where it is more acute. In this respect it resembles Halesidota. Fourth median curved slightly, arising much nearer the middle of the wing than in Arctia; and nearer also to the third median, to which it is parallel.

"Its affinity to Halesidota is still more striking in the form of the secondaries, which are much produced towards the apex. The costa is much bent in the middle; in Arctia it is not bent at all, and the long outer edge is somewhat angulated. Legs large and stout, finely scaled, resembling the stout finely scaled legs of Halesidota and Ecpantheria.

"The species are pure white, with black stripes along the nervures, not in the interspaces as in Arctia.

"In the figure of Abbot's, the larvæ of S. echo have the dorsal hairs arranged in high broad tufts which show the transition from Arctia, in the larvæ of which the fascicles are of uniform length, to Halesidota where the fascicles often form tufts and pencils of hairs."

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 119.

1.—SEIARCTIA CLIO. (Pl. 3, fig. 1.)

Seiarctia clio, Packard, Proc. Ent. Soc. Phil., vol. 3, p. 120. (1864.)

"♂.—White, streaked longitudinally along the nervules with black brown. Palpi above black. Prothorax immaculate. Meso-notum with three black stripes, those of the patagia lined without with yellowish; hinder part of the thorax also yellow. Abdomen yellow, with a dorsal and lateral rows of small black spots.

"Primaries pure white; median and internal nervures lined with black, as is the internal margin partially. Ends of the third subcostal, fourth and fifth subcostal entirely, second median entirely, and the remaining median nervules partially black. Secondaries immaculate, except two apical minute streaks. Costæ of both wings beneath cream-white. The black markings distinct beneath. Fore legs darker above than the others, and they are all more or less blackened at the joints above." *Packard.* (loc. cit.)

Expanse of wings, 1.95 inches. *Length of body*, 0.75 inch.

Habitat.—California, (Coll. Edwards, Dr. Behr.)

I have seen but two specimens of this insect, both in the collection of Dr. Behr; one from Downieville and the other from the Yosemite Valley. These localities would indicate that it is a mountain species.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **ARACHNIS**, Hübner.

Fore wings nearly one-third longer than the hind pair, much longer than the body. The subcostal vein forms a small costal cell, immediately behind the origin of the discal vein, and gives rise to a marginal nervule which sends off, near its middle, a short nervule to the costa; near the tip of the wing it sends off the post apical nervule, and behind it becomes bifid. The subcosto-inferior arises on a short stalk common to it and the discal vein. The median vein is four-branched, the fourth median being very remote from the third. Hind wings about equal to the abdomen, broader than the anterior pair, with the neuration as usual in the family.

Head quite small, somewhat depressed, smooth, with ocelli. Front moderately broad, slightly inclined. Eyes very small. Antennæ simple in both sexes. Labial palpi rather short, scarcely extending beyond the clypeus, but slightly curved and ascending, and slightly hairy beneath; third joint short. Tongue exceeding the tips of the palpi by one-half its length. *Clemens*, Proc. Acad. Nat. Sci. Phil., p. 525. (1860.)

But one species is found in the United States, and that is from the Pacific Slope.

1.—**ARACHNIS PICTA**, Packard, (Pl. 3, fig. 6.)

Arachnis picta, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 126. (1864.)

"♀.—Head bicolorous; front, below the base of antennæ, pale slate, above white. Base and tip of palpi vermillion, scales beneath white. Prothorax white, each half with a large round pale slate central spot margined with black. Notum pale slate; patagia margined with black, and a double median black line.

"Primaries pale slate, with five very unequal sigmoid dislocated white bands, broadest upon the costa and margined with black. Third and fourth consist, below the costa, of disconnected dots, and the fifth is

entirely dislocated on the fifth s. c. Secondaries and abdomen pale vermillion. The former with three transverse dusky bands, of which the inner is the broadest; the outer consists of four disconnected spots, and the outer margin is lined with dusky cinereous.

"Primaries beneath with four costal yellow spots, of which the second is much the largest. There are two smaller triangular ones on the internal margin, obscurely connected with the costal one by a dark obscure line, the marginal white line is the same as in the upper surface. Secondaries, costal half of base yellow, with two costal yellow spots, of which the outer is much the smaller; the internal half of the base of the wing is pale vermillion, and the wing below the median nervure is slightly tinged with vermillion. Transverse incomplete lines as on the upper side.

"Legs: femora beneath vermillion, femoral joint and tips of tibiæ and tarsi slate and whitish, ringed with black. Abdomen above vermillion, with a dorsal median broad dusky line and a lateral row of small approximate black dots, bounding the pruinose ventral side."

Packard, (loc. cit.)

The above carefully drawn description of the ♀ leaves nothing to be desired, as the ♂ differs only in being a trifle smaller, while the abdomen shows less of the slaty and more of the rosy tints.

Expanse of wings, 1.50 to 2.10 ins. *Length of body*, 0.60 to 0.80 in.

Habitat.—California, (Coll. Mus. Comp. Zool. A. Agassiz; Edwards, Stretch, Behr, et als.)

Larva.—Entire body warm smoky brown, each segment with a transverse row of rounded paler tubercles, varying on the different segments from seven to nine in number. From each of these springs a divergent bunch of stiff, rigid, moderately long black hairs of irregular length, mixed with a few scattered longer hairs of bright reddish brown. In appearance the body is cylindrical, moderately stout, and about equally attenuated at both extremities. Length about 1.75 inches.

The habits of this larva are most interesting. It feeds on the various species of lupins, and appears to be well distributed round the Bay of San Francisco, as I have received the insect from a number of different localities within a radius of twenty miles. It is a nocturnal feeder, hiding in the day time under the dead bark of trees or in other sheltered places. About the 9th of May, 1870, I found a dozen larvæ

under the dead bark of a cottonwood tree. These were placed in a box, and kept well supplied with food for a couple of weeks, but they declined to eat, and remained huddled up in the shadiest corner of the box, retaining this position, almost without change, until the middle of August, a period of over three months, in the height of summer without food. The entire lot then assumed the chrysalis state within a few days, some few without spinning any cocoons. The remainder, as though almost all the moisture in the body had been eliminated during their long fast, wove merely a very thin open white web, dotted with minute glistening white beads, like small dew drops, and entirely free from the hairs of the body, which in *Halesidota* are incorporated into the cocoon. Their peculiar æstivation, seems also to affect the final transformations, as the larva skin retains its shape after the exclusion of the chrysalis, with the exception of the slit on the back of the head and first and second segments, through which the chrysalis escapes. The latter is seldom more than half extruded from the larva skin. This remarkable æstivation has been observed in all the larvæ we have raised, (and while these have been numerous, I have never taken an imago at large) and was first pointed out to me by Mr. H. Edwards; who also called my attention to the color of the last pellet of excrement passed by the larva. This is reddish, and appears to be the inspissated equivalent of the drop of fluid usually passed by the imago, soon after its exclusion from the chrysalis. Out of ten imagines evolved from this batch of larvæ, not one of them passed anything before they were killed, thus proving how complete is the elimination of all extraneous matter from the intestines during the larval existence.

This insect approaches *A. aulæa*, Hübner, from Mexico, very closely, if it be not the same thing, in which latter case *Ecpantheria incarnata*, Walker, should be added as a synonym. The descriptions of these two species agree with that of *A. picta*, except in the color of the spots on the underside of the primaries, which are said to be *red* in the two former species, while in a long series of *A. picta* I have never seen them anything but yellowish, or yellowish white. Boisduval (Ann. Soc. Ent. Belg., p. 78, 1868–9,) indeed refers to our Californian species as *E. aulæa*, Hübn., stating that he has also received the same from Mexico. While strongly of the belief that these will all prove to be descriptions of the same species, it did not seem advisable in the absence of Geyer's figure for comparison, to run the risk of introducing confusion into the synonymy, and for that reason Packard's name is

retained; but if these suppositions are correct, Mexico must be added to the geographical range, and the synonymy will be as follows:

Arachnis aulæa, Hübner.—Geyer, Zütr., 913, 914.

Ecpantheria incarnata, Walker, Cat. Lep. B. M.

" " Clemens, Proc. Acad. Nat. Sci. Phil., p. 524. (1864.)

Arachnis aulæa, Clemens, Proc. Acad. Nat. Sci. Phil., p. 526. (1860.)

" *picta*, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 126. (1864.)

Ecpantheria aulæa, Boisd., Lep. Cal., p. 78. (1868–9.)

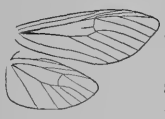
BOMBYCIDÆ.

ARCTIINÆ.

Genus **HALESIDOTA.** Hübner.

Fore wings narrow, the subcostal vein with two marginal nervules from the disc, with an apical nervulet near the tip, midway between the origin of which, and that of the subcosto-inferior nervule arises the post apical. Median vein four-branched, the posterior nervule moderately remote from the penultimate. Hind wings, neuration arctiæform.

Head moderate, short, rather woolly, with ocelli. Front tapering, moderately broad. Eyes rather large. Antennæ slightly pectinated in the ♂. serrated in the ♀. Labial palpi stout, porrected, exceeding the clypeus somewhat, and squamose; the basal and middle joint about equal; terminal joint conical, very minute. Tongue as long as thorax beneath.



Body stout. Thorax smooth with decumbent hairs. Patagia erected, moderately large. Breast slightly hairy. Abdomen smooth. Legs stout and smooth; the tibial spur of the fore legs rather long, concealed; hind tibiæ with four moderate spurs.

Clem., Proc. Acad. Sci. Phil., p. 533. (1860)

The following is an attempt to tabulate the North American species:

* Primaries banded.

Yellow, rusty bands, abdomen yellowish - - *H. Agassizii.*

Ochreous, smoky brown bands, abdomen verm'ln *H. Edwardsii.*

Pale tawny, darker tawny bands, abdomen tawny *H. tessellaris.*

* Primaries spotted.

Dark brown, spots white.

Patagia dark brown - - - - *H. sobrina.*

" striped brown and white - - *H. argentata.*

Tawny, spots brown - - - - - *H. maculata.*

Reddish brown, spots yellowish - - - *H. cinnamomea*

Yellowish, dusted with rusty, spots white - *H. caryæ.*

1.—HALESIDOTA EDWARDSII. (Pl. 3, fig. 5.)

Halesidota Edwardsii, Prof. Proc. Ent. Soc. Phil. III., p. 129. (1864.)
Halesidota translucida, Walker.

Phægoptera Quercus, Boisd., Ann. Soc. Ent. Belg. XII., p. 81. (1868-9)

♂.—Ochreous and vermillion. Head ochreous. Palpi vermillion, clothed beneath with ochreous hairs, apical joint black. Antennæ brown, slightly vermillion at the base. Thorax and patagia hairy, ochreous, the patagia much less distinct than in *H. tessellaris*. Abdomen hairy, vermillion above, pale ochreous beneath, as is also the thorax. Legs pale ochreous, tibiæ and tarsi annulated with brown, tibial joints also marked with the same color. Tibiæ vermillion inside.

Primaries very thinly scaled, subdiaphanous, ochreous, with five powdery smoky brown bands, the first at the base very incomplete; second strongly arcuate outwardly; third straight, not oblique; fourth and fifth nearly parallel with the outer margin, which is also broadly of the same color; the third and fourth bands are fused on the inner margin, forming a V. In specimens at all worn these markings are only clearly visible on the costa and inner margin.

Secondaries nearly colorless, diaphanous, slightly vermillion on the inner margin, narrowly dusky at apex.

Beneath, the markings of the primaries are faintly reproduced. On the secondaries the costa is opaque, ochreous, with two brownish spots.

♀ resembles the ♂, except that the abdomen is less hairy and is ornamented on the three terminal segments with a blackish, dentate, dorsal mark, widest on the terminal segment.

Expanse of wings, 1.80–2.10 ins. *Length of body*, 0.85–0.90 in.

Habitat.—California, (Coll. Edwards, Behr, et als.)

Larva.—Length, 1.50 inches. Head dark brown, very large. Thoracic legs reddish brown, abdominal legs tawny. Body stout, depressed, densely clothed with moderately long rich brown hairs of uniform length, giving the larva a brush-like appearance. The sides of the body as well as the caputal and anal segments, have scattered long silky hairs of a tawny yellow. The cocoon is composed chiefly of the hairs of the larva, and although of considerable density, is but slightly bound together with silk, of which a very small quantity is used in its construction. The larva is full fed about the end of June, and the imago is disclosed during the latter part of July.

EXPLANATION OF PLATE 3.

1.—Seiarctia Clio., Packard - - - California.
2.—Epicallia virginalis, Boisd., var. ochracea "
3.— " " " " guttata - "
4.— " " " type - - "
5.—Halesidota Edwardsii, Packard - - "
6.—Arachnis picta, Packard - - "
7.—Arctia autholea, Boisd., ♀ - - - "
8.— " " " ♂ - - "
9.— " Edwardsii, Stretch - - - "
10.— " dahurica, Boisd. - - - "
11.— " Behrii, Stretch, ♀ - - - "
12.— " " " ♂ - - - "
13.— " Bolanderi, Stretch - - - "
14.—Phryganidia Californica, Packard, ♀ - "
15.— " " " ♂ - - "


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This species is abundant in the neighborhood of San Francisco, feeding on the various species of oak. The larva is nocturnal in its habits, and in the day time may be found crowded into holes and cavities (generally in families) and often in places where it seems scarcely possible for them to penetrate. The imago is much rarer than the abundance of the larva would indicate, as the latter are very subject to the attacks of ichneumous, chiefly of small size.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **PHRYGANIDIA.** Packard.

Front broad, narrowing towards the mouth, sides parallel. In the ♀ the clypeus is shorter than in the ♂. Maxillæ as long as the thorax. Palpi ascending, curved, very narrow and slender, tips just passing beyond the front; third joint continuous with the second. Antennæ long and broadly pectinated, in the ♀ subsimple; pectinations being nearly obsolete.

Thorax moderately stout, the patagia are more hairy than the rest of the thorax. Wings long and broad. Primaries: length to breadth as 7.5 to 3.6. Costa slightly convex, straight in the middle. Apex subrectangular, obtusely rounded. Outer margin moderately oblique. First subcostal straight, arising just before the origin of the third subcostal; second arises more than half way between the origin of the third and fifth; third divides in the middle of its length, the interspace being short triangular; fifth subcostal is slightly removed at its origin towards the middle of the discal space. Second and third median nervules are very short, dividing on the first third of the distance from the discal nervules. Fourth median very short.



Internal angle of the secondaries much rounded, hardly reaching to the tip of the abdomen. Costa straight, a little full near the base, while the wing is much produced towards the much rounded obtuse apex, being still more rounded in the ♀. The two subcostal nervules are thrown off very near the apex. In both wings the two discal nervules are continuous and very oblique. The second and third median are very short, arising very near the outer margin of the wing.

Legs long and slender, closely and finely scaled; hind tibiæ long, provided with four moderate equal spurs; tarsi nearly as long as tibia. Abdomen cylindrical, long, rather slender, tip obtuse. In the ♀ it is shorter and obtuse.

The genus is not only much larger than *Heterogynis*, but differs from it in many respects. * * * The neuration of the two

genera is very dissimilar. In our genus the median nervules are longer, and arise much nearer the middle of the wing, especially the fourth median. The second and third median nervules in both wings are in *Heterogynis* remote at their origin, while in Phryganidia they arise from a common branch which is thrown off from the main nerve. This is very abnormal in the moths. * * * *

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 348–9.

The transformations of P. Californica on which this genus is founded, are so dissimilar to those of the true Psychiinæ, that I remove the genus to its present position, though with some hesitation, and chiefly because I feel unable to assign it a more satisfactory position. Not only does the larva construct no "sac," but it does not even construct a cocoon of any kind, and the pupa is naked and suspended by the tail. It transformations are given in their appropriate place.

1.—PHRYGANIDIA CALIFORNICA. (Pl. 3, fig. 14 ♀, 15 ♂, pl. 10, fig. 4 *larva*, 5 *pupa*.

Phryganidia Californica, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 349. (1864.)

♂.—Pale brown. Antennæ smoky black; palpi, front, base of the patagia, and an interspaceal row of three cloudy spots immediately outside the discal vein, yellowish ochre. All the remainder of the insect pale sable brown, wings somewhat transparent and nervules darker; secondaries paler than the primaries. Abdomen slender and cylindrical.

♀.—Resembles the male except that the yellowish spots on the primaries are absent, the wings are more transparent, and the costa of the primaries is more rounded, while the abdomen is stouter, abruptly pointed, and terminated with two short stiff spines.

Expanse of wings, ♂ ♀ 1.50 inches. *Length of body*, 0.55 inch.

Habitat.—California, (Coll. Edwards, Behrens, etc.)

Larva.—Slender; head very prominent, globose; last segment but one-humped; length 0.90 to 1.00 inch.

Head pale brown. Body black above, dirty green below, with a broad dorsal line of dirty greenish, divided by three narrow black lines, and the sutures faintly marked with the same color. There is also a narrow, broken stigmatal line of dirty greenish, and a similar line above each of the abdominal legs. Tip of the last segment horny, the segment

not being used to assist in progression, but usually slightly elevated. Body smooth, transversely winkled. Younger specimens differ chiefly in the disproportionate size of the head.

Pupa, suspended by the tail, naked, greenish white with black markings. Head and eyes prominent, front broad, maxillæ legs and antennæ well marked, antennæ equal in length to the wing cases and separating them. Prothorax broad and short; mesothorax prominent, oval; metathorax well developed; abdomen conical, sharply truncated, with terminal spine. Wing cases ample, extending to beyond fourth abdominal segment. All sutures of head and thorax, legs and antennæ lined with black; the eyes are also of the same color, as well as the nervules, which show clearly on the wing cases. The mesothorax has a central black line; the abdomen has a dorsal row of black points on the anterior margin of each segment, and a lateral row of black spots blending into each other towards the anal segment, which is black. Stigmata black. Abdomen below with two sublateral series of black transverse spots nearly blending into two longitudinal bands. Length 1.20 inch.

This insect is exceedingly abundant round the Bay of San Francisco and probably in many other portions of California, occurring in some seasons and localities in such numbers as almost to strip the live oaks on which they feed, of their foliage. The first brood is evolved about the 15th of June, and is followed by an autumnal brood. When first hatched the young larvæ appear to be nearly all head, so disproportionate is the latter to the rest of the body; as maturity is approached the disproportion decreases, but the head is always greater in diameter than the body. The larvæ feed singly, and appear to make little if any use of the anal feet, as means of progression, generally carrying the last segment elevated in the air, and in this respect show a certain affinity to some notodontians as well as to Cerura and Platypteryx. The insect cannot, however, be classed with these genera. Packard quotes Heterogynis as the nearest ally, and points out the differences between the two genera. Now Heterogynis is removed by many European writers to the Zygænidæ, and it seems to me that Phryganidia should be also removed to that group, instead of being classed among the Psychidæ, as originally described by Packard. One of the distinctive features of the Psychidæ is the case-bearing habit of the larvæ, and the generally apterous condition of the females. Phryganidia possesses neither of these characteristics, the larva being naked with the normal lepidopterous form, and the pupa without surrounding envelope and suspended by the tail, as in many Rhopalocera and some Geometræ. This latter

habit is very abnormal among the Heterocera, especially Zygænidæ and Bombycidæ. In form the larva has some resemblance to that of Psychomorpha and Eudryas, and my impression is that its allies must be looked for among such genera as Procris and Ctenucha, and that its true place is intermediate between these two forms. The males fly readily through the hot sunshine round the tops of the oaks, but the females are only occasionally taken on the wing.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **EUPREPIA.** Germar.

Head small, not prominent. Front long and narrow, sides parallel; finely scaled. Palpi stout, finely scaled, terminal joint pendent, slender, projecting beyond the front. Eyes large. Antennæ rather longer than the thorax, approximate at the base, finely pectinated in the ♂, subsimple in the ♀.

Prothorax hairy, vertical, nearly concealing the head from above; thorax and patagia clothed with long hairs. Abdomen stout, smooth, extending slightly beyond the hind wings. Legs stout, smooth; femora hairy; the middle pair with two, the hind pair with four short unequal spurs.

Wings ample. Anterior pair with the costa straight on the basal half, thence gently rounded to the subquadrate apex; outer margin full, rounded; anal angle distinct; inner margin straight, convex at the base. Median nervules arise a little beyond the middle, first and second close together at their origin and curved downward; fourth four times as far from the third, as third from second. Costal nervure long, reaching nearly to the apex. First and second subcostals thrown off before the discal vein, long, parallel with the costal nervure; third subcostal arises at the discal vein, unites with the second to form a long narrow cell, and is thence continued independently, throwing off the fourth nervule to the outer margin, midway to the apex, and afterwards bifurcating, both branches going to the costa. Fifth subcostal arises on a short stalk at the discal vein, the latter being very slender and strongly angulated inwardly.

Secondaries have the costa slightly angulated, outer margin full and rounded, anal angle rounded. Costal vein long, arising from the same stock as the subcostal.

Coloration bright and conspicuous; primaries brown, with light irregular bands similar to Arctia, secondaries spotted. The larva is clothed with very long silky hair, thus differing strikingly from *Arctia*, and showing a closer relationship with *Epicallia*, although approaching the former genus in the style of ornamentation. But one species is found in North America.

1.—EUPREPIA AMERICANA. (Pl. 4, fig. 4, ♀.)

Arctia Americana, Harris, Rt. Ins. Mass., p. 246. (1841.)
Arctia Americana, Harris, Agass. Lake Sup., pl. 7, fig. 5. (1850.)
Chelonia caja, Boisd., Lep. Cal., p. 27. (1852.)
Arctia caja, Walk., Cat. Lep., B. M. (1855.)
Arctia caja, Fitch.
Arctia caja, Mœschler, W. E. M. 4, p. 360. (1860.)
Arctia Americana, Clem., Proc. Acad. Nat. Sci. Phil., p. 529. (1860.)
Arctia Americana, Morris, Syn. Lep. N. Am., Supp., p. 336. (1862.)
Arctia Americana, Saun., Proc. Ent. Soc. Phil., vol. 2, p. 28. (1863.) larva.
Euprepia Americana, Pack., Proc. Ent. Soc. Phil., p. 114. (1864.)
Not *Arctia Americana*, Walker, Cat. Lep. B. M., p. 607. (1855.)

♂. ♀.—Head brown, a few scattered reddish hairs on the vertex. Palpi brown, slightly red at base and beneath. Antennæ whitish. Prothorax brown, edged behind with red, and in front *margined with white*. Patagia brown, *white in front and on the outer edge*. Thorax brown, reddish orange behind. Abdomen orange-vermillion with four or five transverse black dorsal spots. Femora reddish, remainder of the legs brown.

Primaries coffee brown, marked with creamy white as follows: A large basal patch, enclosing a brown patch on the costa, and a smaller dot below the median vein. The basal patch is produced into a longitudinal streak below the median vein, which is sometimes connected with the transverse band. This band originates on the inner margin, two-thirds from the base of the wing, runs somewhat parallel with the outer margin to the second median nervule, and is thence sharply angulated backward to the costa. Outside this band is the usual Arctian marking, arising at the inner angle and running direct to the angle in the transverse band, thence, nearly parallel with the costa, to near the outer margin, thence backward at an acute angle, thence at right angles, terminating on the costa midway between the apex and the transverse band. There are, in addition, two spots on the costa, between the basal patch and transverse band, sometimes produced into more or less complete transverse bands, but not passing the longitudinal streak. Fringes brown.

Secondaries bright orange, with seven rounded deep blue spots margined with black, arranged in two rows; the median row consisting of three, and the submarginal row of four spots. In the median row the first spot is on the discal vein, the second is greatly larger and lies across the base of the fourth median nervule, the third is the size of the first and lies on the internal vein. The outer row consists of a small spot on the costa, a large one on the first median nervule, a similar spot on the fourth median and a smaller one on the internal vein. Fringes orange.

Beneath, the markings of the primaries are reproduced, but the basal third is largely reddish, and the white bands are all reddish on the margins of the wings. Secondaries as above, except that the markings are dull black.

Expanse of wings, ♀ 2.90 inches. *Length of body*, 1.00 inch.

Habitat.—New York, (Doubleday, Harr. Coll.) Canada, (Saund.) Vancouver's Island, (H. Edwards.) California, (Boisduval.) Alaska, (Dall.)

Larva.—Saunders (Proc. Ent. Soc. Phil., vol. 2, p. 28) has the following notes on the larva as it hybernates for the winter: "Length, three-eighths of an inch. Head black, body dark brown with transverse rows of tubercles, from which spring dense tufts of intermingled white and black hairs. It completes its growth in the Spring and enters the chrysalis state late in May or early in June. Like the *Caja* of Europe, it feeds readily on the common garden lettuce."

While closely allied to the European *E. caja* with which it has been confounded by European writers, it can be readily distinguished, as pointed out by Dr. Harris (Ins. Mass., p. 246, 1841,) by the white edging of the prothorax and patagia, which appears to be a constant colorational difference. Harris gives the color of the posterior wings as yellow ochre, suggesting the possibility of the occurrence of specimens with orange or red hind wings. In two specimens from Vancouver's Island, from which the foregoing description was drawn, the posterior wings are all bright orange. Harris also calls attention to the absence of black spots on the sides of the abdomen in *E. Americana*, which I am unable to verify, owing to the defective condition of the body parts of the specimen before me. Both these specimens (♀) are much larger than any specimens of *E. caja* in my collection, and the posterior wings are more ample and less acute at the apex. Morris (Lep. N. Am., p. 336) gives the color of the spots on the hind wings as black, which must be a mistake, as they are distinctly blue in both species.

I do not find any description of the mature larva of *E. Americana*, but the description of the young quoted above differs materially from that of *E. caja*, in which the long hairs are rusty and black, instead of white and black. The larva of Euprepia is very similar to that of *Epicallia virginalis*, (q. v.) E. Americana appears to be confined chiefly to the northern portion of the continent, but in that region to be widely distributed. In California, its most southern range, it is a mountain insect, altitude taking the place of latitude.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **LEUCARCTIA.** Packard.

"Front thickly covered with short hairs. Antennæ well pectinated, the pectinations in the ♀ being as long as the joints of the antennæ themselves, which are annulated above with white and black. Clypeus short, somewhat sunken between the eyes; the sides nearly straight; front edge square, slightly notched at the foramina. Labrum short, obtusely rounded. Mandibles minute, discoverable by a few setæ. Maxillæ stout and well developed. Palpi depressed, hardly surpassing the front, two-jointed, the joints of nearly equal length, the scales on the tip of the basal joint surpassing the tip of the second.

"Thorax and abdomen stouter than usual. The fore wings are convex towards the unusually produced apex; outer margin very oblique, slightly convex. Secondaries: costa hardly bent in the middle; apex produced; outer margin nearly as long as the costa, and regularly convex, reaching a third of the way to the tip of the abdomen. Legs stout, short, femora pilose beneath. Two pairs of tibial spurs very approximate and unequal in size. The tip of the abdomen is conical in the ♂, very obtuse in the ♀.

"While this genus is of much larger size, and possesses quite a different style of coloration from *Spilosoma*, there are many important characters that warrant its separation from that genus. There are marked differences in the relative size and form of the clypeus, and also of the palpi. Though confounded with *Spilosoma* by its narrower primaries, with their very oblique outer edge, it is much nearer to *Hyphantria*, and it should, perhaps, fall between the two genera.

Pack., Proc. Ent. Soc. Phil., vol. 3, p. 124.

1.—**LEUCARCTIA ACRÆA.** (Pl. 4, figs. 1, 3, ♂ ; 2, ♀ . Pl. 10, fig. 6, *larva*.)

♀ . *Bombyx acria*, Drury, 1, pl. 3.

♂ . *Bombyx caprotina*, Drury.

Bombyx caprotina, Cram. Pap. Exot. III, p. 287.

Phalæna acria, Smith, Lep. Ins. Ga., p. 133, Tab. 67. (1797.)

Estigmene acria, Hübn., Samm. Exot. Schmet. Bd. 2, pl. 191. (1806.) Verz., p. 184. (1816.)

Arctia pseuderminea, Harris, Mass. Ag. Rep., p. 332, pl. 1. (1823.)

Arctia acria, Harris, Cat. Ins. Mass. (Hitch. Rt., p. 591.) (1833.) Rt. Ins. Mass., p. 251. (1841.)

Spilosoma acrea, West. Ed. Drury I., pl. 3, figs. 2, 3.

Spilosoma acrea, Walk., Cat. Lep. B. M. III., p. 667. (1855.)

Spilosoma acrea, Duncan, Nat. Lib., vol. 32, p. 171, pl. 20, figs. 1, 2, 3. (1858.)

Spilosoma acrea, Clem., Proc. Acad. Nat. Sci. Phil., p. 531. (1860.)

Spilosoma acrea, Harris, 3d. Ed., pl. 6, fig. 9, ♂, 10, ♀, fig. 169, *larva*. (1862.)

Spilosoma acrea, Morris, Syn. Lep. N. Am., Supp. p. 342. (1862.)

Leucarctia acræa, Pack., Proc. Ent. Soc. Phil., vol. 3, p. 124. (1864.)

♀ .—Head, patagia, thorax above and below, white. Palpi, eyes and antennæ black. Abdomen yellow ochre above, beneath white, as are also the basal segment and tip; a dorsal row of six black spots, a lateral row of geminate black spots, a ventral, and two subventral rows of the same color. Femora of all the legs more or less ochreous, fringed beneath with white hairs, and tipped at the joints with black; tibiæ and tarsi black, annulated with white.

Wings: primaries white, marked with black dots, as follows: six costal spots, and an outer marginal row of interspaceal black dots. Two dots near the base, an oblique median row, parallel with the outer margin, and two approximate submarginal rows, more or less complete. The median band is sometimes connected by two spots with the third costal spot from the base giving it an angulated appearance. Fringes white.

Secondaries *white*, marked with black, as follows: A discal spot, and a submarginal band of 3-6 spots, generally largest near the anal angle.

There is sometimes a faint trace of a very narrow marginal band near the apex. Fringes white.

Beneath white ; on the primaries, the costal spots, the marginal dots, and the outer row of the geminate submarginal band, are more conspicuous. All the other spots are obsolete, but there is, in addition, a large spot on the discal vein scarcely visible above. Secondaries as above, except that the markings are somewhat larger, and there are, in addition, two or three black spots on the costa. All the markings beneath are brownish black.

The above description is drawn from two specimens, one from the Atlantic States, the other from California, which differ in no wise, except in the larger size of the western insect. These insects have, I believe, *all* the markings peculiar to this species (pl. 4, fig. 3, contains nearly all of them), but very generally a large portion of the transverse rows are obsolete, while the costal spots are always present (pl. 4, fig. 2.)

♂.—Differs from the ♀ in the following details : The abdomen is yellowish below and has seven dorsal black spots. The secondaries are yellow ochre above, and all the wings are yellowish beneath, with the costa of the primaries whitish. Two Californian ♂ have the markings described above in the ♀ ; in two ♂ from the Atlantic States the markings are reduced in size and more or less obsolete.

♂. *var.*—A variety of the ♂ occurring in California has the outer half of the primaries and all the secondaries suffused with smoky, as well as the entire under surface where it is yellow in the type (pl. 4, fig. 1.)

Expanse of wings, ♂ 2.30, ♀ 2.50 inches. *Length of body*, ♂ 1.00, ♀ 1.00 inch.

Habitat.—Atlantic States, Southern States, California, Mexico (?) (Coll. generally.)

Larva.—Dr. Harris (Ins. Inj. Veg., p. 250) gives the following description : "The full grown caterpillar measures one inch and three quarters or more in length. It is clothed with long hairs, which are sometimes black and sometimes brown on the back and fore part of the body, and of a lighter brown color on the sides. The hairs, like those of the other Arctias, grow in spreading clusters from warts, which are of a yellowish color in this species. The body when stripped of the hairs is yellow, shaded at the sides with black, and there is a blackish line extending along the top of the back. The breathing holes are white, and very distinct through the hairs." The following description

is drawn up from a mature Californian larva, and differs materially from that just quoted :

Length 2.00 inches. Head black, clypeus and palpi clear yellow.

Body *black* above, mottled with smoky ; smoky below ; with a double broken yellow lateral band, extending from segments four to eleven, inclusive, the space between the two bands mottled and yellowish. Body covered with tubercles, arranged as follows : segment 1 has six, segments 2-3 have eight, segments 4-10 have twelve, segment 11 has ten, segment 12 has six. Of these tubercles the four dorsal rows are black, giving rise to fascicles of long, irregular, blackish brown hairs, the two central rows being obsolete on segments 1, 2, 3 and 12. All the other tubercles are rusty red, and carry long silky rust-red hairs, except those near the head, which are mingled with blackish, as are also those on the anal segments. The hairs on segments 10 to 12 inclusive, are longer than those on the rest of the body. Stigmata yellowish. Prolegs black, banded with yellowish. Abdominal legs flesh colored.

Larvæ as above produce imagines in no wise distinguishable from eastern specimens. It is given as the extreme of divergence in color, as many Californian larvæ approach more closely the diagnosis of Dr. Harris. It would be interesting to determine whether these differences in color are sexual, or due to the effect of different food. In the allied genus Antarctia, Hübner, the larvæ of the two sexes are so dissimilar, that they can be readily separated, although perhaps this is scarcely a parallel case as the ♂ ♀ imago are so different that they might be referred to two separate genera by persons ignorant of their transformations. A similar case of discrepancy in the color of the larva between the eastern and western portions of the continent, is to be found in the case of Pyrrharctia isabella, *Pack.* Eastern larvæ are black, with a chestnut red band in the middle of the body, yet I have raised imagines distinguishable, so far as I can see, by no valid specific difference, from larvæ found in California of a uniform greyish brown.

Dr. A. S. Packard, jun., to whom I forwarded Californian specimens, informs me that L. Californica, *Pack.*, is synonymous with L. acræa. ♀ specimens received from Mazatlan, Mexico, appear to extend the range of L. acræa to that region, as I am unable to seize upon any distinctive difference, although there is a general appearance about the Mexican specimens, which at first sight would seem to indicate a separate form. I have also in my collection, specimens of another species received from the high Sierras of southern California, with imma-

culate wings, which I believe to be undescribed, and which is identical with specimens from Costa Rica. A few insects just received from Arizona corroborate this fact, and show that probably many Mexican insects will have to be included in our fauna.

2.—HALESIDOTA AGASSIZII.* (Pl. 4, figs. 8, 9. Pl. 10, fig. 7, *larva.*)

Halesidota Agassizii, Pac., Proc. Ent. Soc. Phil., vol. 3, p. 128. (1864.)

Halesidota Californica, Walker.

Halesidota Angulifera, Walker, Lord's Nat., Brit. Columb. (1866.)

Phægoptera salicis, Boisduval, Lep. Cal., p. 81. (1868-9.)

♂. ♀.—Head, palpi, antennæ and thorax lemon yellow, with the tips of the palpi, two small dots on the prothorax and the inner side of the base of the patagia reddish brown, which color sometimes tinges the thorax. Legs rather darker than the head. Abdomen paler.

Anterior wings lemon yellow, crossed by four clear reddish brown bands; the first at the base very incomplete; the second narrow and curved outward; the third broad, forking on the fourth median, the outer branch containing a darker cloud on the discal vein; fourth parrallel with third and outer margin, widest and darkest on the costa. There is sometimes, in addition, a submarginal concolorous series of interspaceal dots. Fringes lemon yellow.

Secondaries pale, whitish tinged with yellow, immaculate. Beneath paler than above, the markings on the primaries nearly obliterated, leaving only the dark spot on the discal vein, and the costal portion of band four.

Expanse of wings, 1.65 inches. *Length of body*, 0.68 inch.

Habitat.—California, (Coll. Edwards, Stretch, etc., Mus. Comp. Zool. Agassiz.) Nevada, (Coll. Eaves.) British Columbia, (Walker, H. Edwards.)

The markings on the primaries are very liable to more or less complete fusion, so that the identity of the bands is somewhat destroyed; the second band being fused with the third, the interval usually existing between them being represented by a few pale spots, and the third band, instead of being forked, containing only a pale spot near the costa, (pl. 4, fig. 9.) Specimens from Nevada are large and highly

* See page 87, ante.

colored. These variations may have been the cause of Walker describing *H. anguliferа* as distinct from his *H. Californica.* Boisduval's name of *H. salicis*, was Dr. Behr's MS. name, and was attached to this species many years ago. It is abundant round San Francisco, Cal., and extends as far eastward as the western portion of the State of Nevada, and as far north as Vancouver's Island.

Larva.—Head, body and prolegs entirely black. Abdominal legs pale dirty yellow. Body slightly depressed, densely clothed with evenly cut velvety black hairs, except on the seventh and eighth segments which are bright lemon yellow, with a small black dorsal lozenge-shaped patch of black on each. The caputal and anal segments have numerous slender pencils of pale yellow hairs, much longer than the general clothing of the body, in this respect resembling the larva of *H. tessellaris* but differing from that of *H. Edwardsii*, where these pencils do not occur. *Variety.*—In some instances the black hairs are confined to the two anal and two caputal segments, all the remainder of the body being yellow, with black dorsal patches as in the type.

The cocoon is obtusely oval, tolerably compact and composed chiefly of the hairs from the body of the caterpillar, with but a small amount of silk in its composition. The larva is double brooded, and feeds on the willow ; the first brood appears on the wing, in June ; the second being full fed about the middle of October, and disclosed from the pupa early in the Spring.

H. Agassizii differs from the other species of the genus found in the United States, in the absence of all tendency to semi-transparency in the anterior wings, such as appears in the thinly scaled *tessellaris* and *Edwardsii ;* or to silvery markings as in the case of *caryæ* and *argentata ;* the costa is also less rounded at the apex than in any of the species mentioned, but the larval characters clearly retain it in the genus.

BOMBYCIDÆ.

HEPIALINÆ.

Genus **STHENOPIS.** Packard.

"Head small, prominent, front longer than broad, narrowing a little anteriorly; scales of the front long pilose, thin. Palpi slender, reaching nearly to the front, thinly spreading scales; third joint hardly distinguishable from the second. Antennæ short filiform. Thorax short, subglobose, scales much raised behind.

"Primaries nearly half as broad as long; costa convex at base, and especially so towards the falcate apex, which is subacute; outer margin concave below; internal angle much rounded; inner edge full, convex. Second subcostal nervule subdivides within its middle, while in Hepialus it subdivides beyond its middle. First subcostal much curved beyond its middle, following the contour of the costa.

"Secondaries reach a little beyond the middle of the abdomen; costa somewhat concave before the middle, beyond convex, apex produced acutely; outer margin not very full; wings broadest from the internal angle to the costa. In both wings the distance between the origins of the fourth median nervule and the submedian nervure, where it throws off the connecting branch, is less than the distance between the same nervule and the origin of the third. The reverse of this occurs in Hepialus.

"Legs broadly pilose, spreading on each side the ungues. Hind tarsi closely scaled; ♂ tibiæ with a long broad oblong tuft, once wrinkled. Abdomen long, compressed, with a slight anal tuft.

"This genus is readily distinguished from Hepialus not only by its greater size, but by important structural characters. The head is smaller and more free from the thorax; the wings are more falcate, with a fuller inner edge. The apex of the hind wings is more produced. Hepialus does not possess the large square tuft on the hind tibiæ, nor the elongated abdomen."

Pack., Proc. Ent. Soc. Phil., vol. 3, p. 391.

The species of this genus are generally of large size, and have the wings covered with broad irregular banes of silvery scales. The two

following species from the Pacific Coast, while appearing to belong to the present genus, differ considerably both in size and coloring from those found in more northern latitudes, being destitute of all trace of silvery bands and of rather smaller size even than S. argentata, Packard, which expands two and one-half inches.

1.—STHENOPIS BEHRNSII. N. S. (Pl. 4, fig. 6.)

♀.—Entire insect pale salmon color. Anterior wings rather thinly covered with coarse scales of rather dirty salmon color. Fringes somewhat paler. Posterior wings very pale, the nervules clothed with coarse scales, concolorous with the anterior wings. Beneath all the wings are uniform pale salmon color, rather darker on the costa of all the wings.

Expanse of wings, 2.20 inches. *Length of body*, 0.95 inch.

Habitat.—California, (Coll. Behrens.)

This fine and very distinct species is from the collection of Mr. James Behrens of San Francisco, who received the single female specimen above described from Timber Cove, in Mendocino County, California. I have much pleasure in dedicating this species to this gentleman, from whom I have received many favors, he having placed his entire collection at my service for the purpose of describing the numerous unique specimens contained therein.

1.—STHENOPIS MONTANA.* N. S. (Pl. 4, fig. 7.)

♂.—Entire insect pale brown. Anterior wings with a narrow, subbasal, oblique paler band, edged with darker, terminating on the subcostal vein where it is suddenly enlarged; an extra median double row of interspaceal light curved lines, edged outwardly with darker, somewhat bent outward as they approach the costa; a pale obscure submarginal band edged with paler, and exteriorly with darker between the nervules, but not reaching the apex; and finally an indistinct series of marginal interspaceal dark angular streaks. The basal and costal regions are somewhat darker than the rest of the wing, and the apical half of the costa shows three or four pale whitish yellow spots. Fringes concolorous.

* Through an oversight, the lithographing of the figure is defective on the left side. The markings on the right wings are correct.

Secondaries pale brown somewhat darker on the apical half of the costa, where are faint indications of two or three paler spots.

Beneath uniform pale brown, except four or five pale whitish spots on the apical half of the costa of the anterior wings.

Expanse of wings, ♂ 2.10 inches. *Length of body*, 0.90 inch.

Habitat.—California, (Coll. H. Edwards.)

Described from a single specimen taken by H. Edwards, Esq., in the neighbourhood of Lake Tahoe, on the Sierra Nevada mountains, at an elevation of about 6,000 feet. The costa of the anterior wings is straight, suddenly convex at the base, and slightly falcate. Outer edge quite oblique; anal angle rounded, inner margin straight, very convex at the insertion of the wing. The secondaries have the costa slightly concave, very strongly rounded to the acute apex; outer margin straight, two-thirds as long as the inner margin; anal angle rounded. The entire coloration of the insect is very obscure.

BOMBYCIDÆ.

CERATOCAMPINÆ.

Genus **HEMILEUCA.** Walker.

"Front of the head broadly subtriangular, spreading pilose. Joints of the antennæ short, a little serrated beneath, with broad pectinations, each joint being provided with two pairs of pectinations, of which the second is nearly obsolete. Eyes small, sunken. Foramina large and conspicuous when the head is denuded. Mandibles obsolete, represented by a slight elevated line curving inwards towards the narrow linear mouth. The maxillæ form the membranous ridges diverging from the under side of the mouth. The palpi consist of two small elongated cylindrical tubercles, with a few long scattered scales. Thorax short and round. Fore wings scarcely longer than the body, one half as long as broad; costal margin straight, rounding at the apex; outer margin very oblique. Third and fourth subcostal nervules arise farther out than the first median, and the discal area is produced outward at their origin, and made narrower by the angulated base of the first median.

"Secondaries reach nearly to the tip of the outer margin. Discal nervules situated beyond the middle of the wing the subcostal and median nervules being short. Wings sparsely covered with narrow subtriangular scales, laid on more thickly at the base and along the costa of the wings, while the middle area is partially translucent. An irregular dark patch surrounds the narrow linear transparent discal region. An irregular light translucent broad mesial band crosses both wings alike. The fore tibiæ are densely pilose. Tarsi thickly spined beneath; ungues long and slender."

Pack., Proc. Ent. Soc. Phil., vol. 3, p. 382.

The above diagnosis was drawn up from H. maia, and appeared as *Euchronia* of Packard. The four species found in North America may be tabulated thus:

* All the wings with pale markings.
 † Light band continuous.
 Patagia black - - - - - - - - *H. maia.*
 Patagia whitish - - - - - - - *H. nevadensis.*
 †† Light band broken - - - - - - *H. Grotei.*
** Primaries only with pale markings - - - - *H. juno.*
*** Primaries without pale markings - - - *H. Californica.*

1.—**HEMILEUCA NEVADENSIS.** N. S. (Plate 4, fig. 10, ♂.)

♂.—Head and appendages black. Prothorax pale rusty; *patagia whitish* and very hairy. Thorax and abdomen black, anal tuft bright rust red. Beneath black. Legs black with some rusty hairs on the femora.

Wings black and pale yellowish, subdiaphanous. Anterior wings very pale yellowish, with the costa edged with deep black; the basal third of the wing is also black, and the outer margin has a broad dusky band, the nervules traversing it being deep black. The discal lunule is transverse, long and narrow, surrounded by a blackish halo. connected *only* with the black costal margin, being remote from the black base of the wings.

Secondaries also very pale yellowish, black at the base, with a dusky margin on the outer limb, terminating at the anal angle, and not connected with the black basal region. Discal spot dusky, small, with whitish transverse centre. Fringes of all the wings deep black. When the wings are expanded, the black basal portion forms a very even equilateral triangle. Beneath as above.

Expanse of wings, 2.50 inches. *Length of body*. 0.95 inch.

Habitat.—Nevada, (Coll. Dr. Behr.)

Described from two ♂ taken on the wing at Dayton, Nevada, flying in the day time round willows, in August. The insect was not uncommon, but a number of other specimens taken at the same time were unfortunately destroyed by accident. Both the specimens agree very closely with the above description, and may be distinguished from *H. maia*, its nearest ally, by the following characters: There is much more pale coloring on all the wings. On the primaries the halo round the discal spot is *separated* from the basal patch, and the outer marginal black band is not more than half the width. This last character is true also of the secondaries, while at the same time the black discal spot is larger than in *H. maia*. Finally, the patagia are whitish instead of black. Though apparently not rare in Nevada, this insect has not been detected in California.

BOMBYCIDÆ.

PLATYPTERYGINÆ.

Genus DREPANA. Schrank.

Wings ample, body slender. Head broad, flat. Front wide, somewhat longer than broad, sides nearly parallel, smooth and finely scaled. Palpi short, closely appressed to the head, not exceeding the front. Tongue short. Antennæ short, simple in ♀, with long pectinations in ♂. Thorax slender. Patagia small, hairy. Abdomen slender, cylindrical, smooth, not reaching the anal angle of secondaries. Legs long, slender; two posterior pairs each with two spurs on the apex of the tibiæ.

Anterior wings broad; costa full at the base, straight in the middle, very convex on the outer third. Apex very acute and much produced, distinctly falcate. Outer margin smooth, somewhat convex near the anal angle, which is distinct. Inner margin rather longer than outer margin, straight. Median vein four-branched; second median nervule as far from third as third from fourth. Internal vein straight. Costal vein long, terminating near the apex. Subcostal very close to costal vein. First subcostal nervule arises midway between the base of the wing and discal nerve, and forks near the apex, both branches going to the costa. Second and third subcostal nervules long, bent downward to the outer margin. Discal vein strongly angulated outwardly, the median branch much the longest.

Secondaries ample; costa straight, full at the base; apex and outer margin rounded; anal angle distinct; inner margin long and straight; costal vein long, straight, much arched at its basal origin. Subcostal vein slender, very near the costal, forking at its middle, where it nearly merges into the costal vein. Median vein four-branched, nervules very long; second median nervule twice as far from third as first from second; second nearly as far from third as third from fourth. Internal vein long.

Larva closely allied to that of *Cerura*.

This genus is distinguished from Platypteryx *Laspeyres* (Edapteryx, *Packard*) by the distinctly falcate anterior wings, and the entire, instead of sinuated outer margin. Laspeyres' genus originally included the

three modern genera Drepana, Platypteryx and Cilex, which correspond to his sections A, B and C. Schrank had previously created the genus Drepana, with *D. falcataria*, which belongs to Laspeyres' section A, as the type. This name has therefore priority, while Laspeyres' name has been retained for section B, to which *P. lacertinaria* and *P. bilineata* belong.

Three species of this genus are found in the United States; D. arcuata and D. genicula in the Atlantic States, and D. siculifer in California. They are so closely allied that it is difficult to present their distinctive points in a tabular form.

1.—DREPANA SICULIFER. (Pl. 4, fig. 11, ♀.)

♂. ♀.—Head pale rusty brown, darker on the vertex. Palpi concolorous. Thorax and patagia very pale, nearly white, the latter hairy. Abdomen smooth, rather darker. Legs pale rusty brown.

Anterior wings very pale brownish white, with a faint purplish tinge centrally. An oblique cloudy rusty brown band, originating at the outer third of the inner margin, and going direct to the apex, followed externally by the following markings in the order named; first, a narrow pale line; secondly, a dusty clouded band sinuated on the outer edge; thirdly, a sinuated pale band, and fourthly, a sinuated dark powdery band nearly parallel with the outer margin, between which and the outer margin the wing is pale. The apex of the wing outside the principal oblique band is purplish black. Inside this band there are three dusky sinuated transverse lines, equidistant from each other on the inner margin. The first is near the base, somewhat curved outwardly; the second is nearly parallel to the first and produced outwardly into acute angles on the median and subcostal veins; the third is parallel to the main band and before reaching the costa is bent back at a very acute angle reaching the costa two-fifths from the apex. Outside this line on the costa are two indistinct oblique lines directed towards the apex. Costa tinged with rusty brown, more distinctly so near the apex. At each end of the discal vein is a small blackish dot and a third in the discal area. The spot at the junction of the discal and median nervules is sometimes enlarged and more diffuse as in the figure, and as was also the case in the type of the species as described by Mr. Packard. Fringes rusty brown, pale outwardly, darkest near the apex.

Secondaries very pale, nearly white, with dark submarginal sinuated

transverse purplish lines originating on the inner margin diminishing in length towards the base. There are also traces of a fifth just inside the submarginal line, partaking more of the character of a shade than a distinct line. An indistinct dark spot on the discal vein at its junction with the subcostal. Fringes rusty brown.

Expanse of wings, 1.60 inches. *Length of body*, 0.50 inch.

Habitat.—California, (Coll. Edwards, Stretch.)

Closely allied to D. arcuata, from the Atlantic States and D. falcataria from Europe; even more strongly to the latter than is the former. Compared with D. falcataria our species is larger, specimens of the former before me measuring only 1.35 inches across the wings; the costa is more convex towards the apex of the primaries; while the apical angle of the secondaries, instead of being nearly square, is very obtusely rounded, giving the insect a mere robust appearance. The markings while essentially the same are more intense in color, especially the oblique brown band, though the transverse lines are also wider, the second and third being closer together than in D. falcataria.

This species is one of the many cases where the insects of the Pacific Coast of North America are almost indistinguishable by definite characters which can be expressed in words, from those of Europe, while at the same time they can be readily separated by their general appearance, from their European allies, when placed side by side. I should indeed have hesitated to separate D. siculifer under Dr. Packard's specific name, had it not been for the differences in color of the larvæ, which added to the modifications in form of the wings and the larger size, seem to warrant such a course, which would not have been admissible on the slight variations in color alone. The larva of D. siculifer is stated by Dr. Behr to be blackish, while that of D. falcataria is described by Stainton (Brit. Moths, vol. 1, p. 163) as "pale green, a broad dark red-brown stripe on the back."

This species is also very closely allied to D. arcuata, *Walker*, from the Atlantic States, which is somewhat a less robust looking insect than D. falcataria so that the three species should follow each other in the following order, D. arcuata, D. falcataria, D. siculifer.

Described from three specimens, all taken by H. Edwards, Esq., in Napa County, California. The type of the species was sent by that gentleman to its describer, but having been unfortunately destroyed on its return, two specimens only are now extant, for one of which I am indebted to the discoverer.

BOMBYCIDÆ.

BOMBYCINÆ.

Genus GASTROPACHA. Ochsenheimer.

Head prominent, smooth. Front long, twice as long as broad, oblique. Palpi stout, long, porrected, greatly exceeding the front, giving to the head the appearance of a beak. Antennæ short, stout, finely pectinated to the tip in the ♂, somewhat pectinated in the ♀. Abdomen hairy, stout, tufted in the ♂, somewhat exceeding hind wings.

Anterior wings with the costa straight, convex at the apex; outer margin rounded, dentate; anal margin rounded, somewhat emarginate, frequently very strongly so; inner margin straight, about equal in length to the outer margin. Costal vein long, reaching nearly to the tip. Subcostal vein five-branched; first originates very near the base, going rapidly to the costal vein; second originates at the middle of the wing, forking near the apex, one branch going to the costa, the other to the outer margin; third originates near the second; fourth and fifth spring from a common stalk as long as the distance between second and third. Median vein with four very long nervules; first and second arise at the middle of the wing; fourth very near the base; third midway between second and fourth.

Secondaries with the angles and outer margin strongly rounded, dentate, generally with a deep emargination on the costa near the apex, the base of the costa which is much rounded, projecting in advance of the costa of the primaries when at rest. Costal vein very distant from the costa throwing off at right angles five small veins towards the costa which are suddenly bent outward as they approach the costa, the main vein being furcate at the outer third. Subcostal vein short, forking inside the middle, and previously throwing off a short transverse branch, which enters the costal vein just before its bifurcation. Median vein four-branched, nervules very long, third nearly as far from second as from fourth; first and second with a common origin.

The species of this genus are difficult to tabulate. It has a wide geographical range, extending from the Atlantic to the Pacific Coast, and from Alaska to southern California, the species from the Pacific Coast being of small size. The larvæ are not gregarious.

EXPLANATION OF PLATE 4.

1.—Leucarctia acræa, Packard, ♂ var. - - United States.
2.— " " " ♀. - - - " "
3.— " " " ♂. - - " "
4.—Euprepia Americana, Harris - - - " "
5.—Notodonta California, N. S. - - - California.
6.—Sthenopis Behrensii, N. S. - - - "
7.— " Montana, N. S. - - - "
8.—Halesidota Agassizii, Packard - - - "
9.— " " " - - - "
10.—Hemileuca Nevadensis, N. S. - - - "
11.—Drepana Siculifer, Packard - - - "
12.—Gastropacha roseata, N. S. - - - "













1.—**GASTROPACHA MILDEI,** (Plate 4, fig. 12).

♂.—Thorax and patagia densely clothed with pale short rusty hairs, slightly mingled with pale grey. Abdomen above and below reddish brown, faintly banded with greyish, largely and squarely tufted.

Anterior wings deeply emarginate at the anal angle, rusty brown with three indistinct bands of blackish tint, consisting of spots divided by the reddish veins. The basal line is short and scarcely reaches the inner margin ; the outer one extends from the emargination to the apex in nearly a straight line ; the central line is nearly equidistant between the other two, slightly sinuated, and strongly angulated near the costa, which is reached about the outer third. The terminal space is thickly powdered with greyish scales, giving it somewhat a dusky shade. The costal and inner margins are rather darker than the disc of the wing, the nervules being of a paler tint and clearly marked. Between the basal and middle row of spots, there are also two others placed transversely in the discal space.

Posterior wings strongly emarginate on the costa, rounded, blackish grey, powdered with rusty scales, and crossed by a narrow transverse sinuated darker band, followed outwardly by an indistinct pale reddish shade. The basal half is slightly redder than the apical half of the wing. Veins narrowly clothed with rusty scales. Fringes on all the wings white interrupted by dark rusty brown points at the termination of the nervules.

Beneath, the anterior wings are rosy grey, pale at the base, which is clothed with long whitish hairs, greyer and darker along the costa, apex and outer margin. Veins not so conspicuous as above. The central angulated line is blackish, unbroken and well defined. The posterior wings are grey ; slightly rosy towards the inner margin, showing the black transverse line and a blackish cloud round the costal margination.

Expanse of wings, 1.40 inches. *Length of body*, 0.70 inch.

Habitat.—California. [Coll. J. Behrens.]

Described from one ♂ in good preservation taken south of San Francisco. This insect is closely allied to *G. tremulifolia* of Europe, from which however it differs structurally in the rounded instead of acute apex of the primaries, which makes the wings proportionally broader. The wings both above and below have many grey scales, which only appear very faintly on the outer margin of the primaries

above in *G. tremulifolia*, in which also the veins are clothed with almost concolorous scales, whereas in *G. Mildei* they are clearly separated by their reddish color from the dusky outer marginal band.

It differs from *G. Americana*, Harris, in wanting the pale band and crescent shaped pale spot on the primaries, and by its smaller size; from *G. ferruginea*, Packard, it may be distinguished by the presence of greyish shades on the wings; from *G. Catifornica*, Packard, it may be separated by its smaller size, the forewings having a length respectively in the ♂ of 0.60 and 0.75 inch, and by the strong ferruginous tint of the primaries; and lastly from *G. Alascensis*, Packard, the only remaining American species, by the color of the wings beneath, which are not "uniformly dark chesnut brown, much as above; with the outer band distinct, and with large triangular dusky spots between the venules," but are quite pale at the base, with the *middle band distinct*, while the outer half of the wing is slightly hoary on a reddish ground, with the veins scarcely distinguishable by difference of color.

At the suggestion of my friend Mr. James Behrens who took the type of this insect, in Alameda County, I have retained his manuscript name of *G. Mildei*, so called after the well-known Professor Milde of Lubeck in Germany, to whom the Entomologists of the Pacific Coast are indebted for many courtesies.

BOMBYCIDÆ.

PTILODONTINÆ.

Genus NOTODONTA. Ochsenheimer.

Head small, hairy, sunk in prothorax. Eyes large. Front narrow, hairy. Palpi very minute. Antennæ moderate, bipectinate in ♂, sometimes only slightly so, simple in ♀. Prothorax, patagia and thorax hairy, scales appressed, raised behind. Abdomen stout, slightly tapering. Legs slender, anterior pair broadly fringed outwardly down to the tarsi.

Anterior wings long; costa straight, moderately rounded on outer third; apex well produced. Outer margin very oblique, slightly convex, very slightly scolloped between veins. Inner margin as long as or only slightly longer than outer margin, with a hairy tooth about its centre. The subcostal vein is 4-branched; the 1st branch rises midway between the base and discal vein, and is very long; the 2d rises one-third of the distance from the discal vein to the apex, and throws off two short branches to the costa; 3rd, rises at origin of second, and 4th at the discal vein, both going to the outer margin. The median vein is 3-branched; 3rd median nervule distant from the origin of 1st and 2d. An intermediate vein springs from the centre of the oblique discal vein.

Posterior wings much shorter than the primaries; costa more or less convex; apex rounded; outer margin more or less rounded; anal angle distinct; inner margin rounded, nearly as long as the outer margin.

Colors of the primaries varying shades of grey or brown; secondaries usually very pale.

The home of this genus appears to be Europe. In America it is represented by three species, which may be distinguished as follows:

* Anterior wings with no transverse lines.

Upper wings pale, with costal patch and dark longitudinal streak - - - *N. Californica.*

** Anterior wings with transverse lines.

With distinct discal spot - - - - - - *N. stragula.*

Without discal spot - - - - - - - *N. basistriens.*

The first of these species is from California, the other two are from the Atlantic States; none of them are abundant in collections.

The larvæ are naked, smooth, variously humped on the back, and tree feeders. It is only by breeding this group that the insects can usually be obtained in numbers. Should the collector be fortunate enough to obtain a virgin ♀, he can usually obtain ♂ ♂ by exposing the ♀ in a muslin covered box, at night time, in the proper locality, as the males are attracted thereby, in a manner similar to *P. cecropia* and other moths of that group.

1.—NOTODONTA CALIFORNICA. (Plate 4, fig. 5) N. S.

♂ — ♀. Head and prothorax pale creamy brown, the latter margined behind with blackish. Palpi dark brown. Patagia greyish brown, mingled with dark and whitish scales, somewhat darkest on the inner edge. Thorax same as prothorax rather darkest behind. Abdomen pale yellowish brown. Legs pale as is all the thorax beneath, except the fringes of the anterior pair above, which are brownish grey.

Anterior wings very pale whitish grey, clouded with clear warm brown at the base, along the inner margin, and on the outer margin; the cloud along the latter diminishing in width towards the apex; there is also a much darker cloud on the costa, near the apex, occupying the basal half of the subcostal interspaces, and only faintly visible below the last subcostal nervule, but reappearing as a cloudy spot at the base of the 1st and 2d median nervules. This costal cloud is divided by the light subcostal nervules, and its very oblique outer edge, leaves between it and the outer marginal shade, a pale oblique band. The outer margin is very narrowly dark brown, followed inwardly with an equally narrow whitish line. The submedian vein is dark brown, whitish on the basal third, and interrupted with two small whitish dots. There is a dark brown longitudinal streak in the interspace below the median vein, below which on the outer third is a pale wedge-shaped dash widest at the outer margin. Fringes dark brown outwardly, paler at the base, somewhat emarginate and whitish in the emarginations, and extending along the margin to the dark long tooth. On the inner margin they are dark, interrupted with a light dot opposite the outer dot on the inner vein.

Secondaries pale, very narrowly margined outwardly with dark brown; and with a dark brown cloud at the anal angle, enclosing a whitish spot on its inner margin, and a pale line parallel with the outer

margin and close to it. Fringes concolorous with adjacent portions of the wing, rather darker outwardly.

Beneath, the primaries are brown, with a costal spot at the outer third, and an apical patch whitish. Fringes dark. Secondaries as above except that the cloud at the anal angle does not appear.

Expanse of wings, ♂, 1.90; ♀, 2.10 inches. *Length of body*, 0.80 inch.

Habitat.—California. (Coll. Dr. Behr.)

Described from 1 ♂ ♀ raised from the larva by Dr. Behr of San Francisco, California. These two specimens are very closely allied to *N. dictæa* of Europe, and it is not without hesitation that I have described them under a new specific name. The chief points of difference are a paler tint of brown on the primaries, and a more uniform color, the extension of the costal cloud to the median interspaces, the much narrower and less conspicuous wedge-shaped dash at the anal angle; and in the posterior wings a rounded instead of produced anal angle. The anal cloud partakes of the characters of both the allied European species, having the white line above the fringe of *N. dictæa*, and the small white spot on the inner margin of *N. dictæoides*. Finally the anterior wings are not so wide in proportion to their length as in the European species.

Larva.—Dr. Behr informs me that the larva is pale green on the dorsal line, darker green and somewhat mottled on the sides, with faint traces of a supra-pedal light stripe, somewhat darker than the dorsal line, with a *straight red horn on the anal segment*. Body small for the size of the imago, head large, rounded, the larva in appearance strongly resembling that of *L. camelina* of Europe. This larva is clearly different from its European allies; and it is this decided structural peculiarity which has induced me to give the insect a new specific name.

BOMBYCIDÆ.

ARCTIINÆ.

Genus LEPTARCTIA. (N. G.)

Head prominent; vertex flat, clothed with long hairs directed forward between the antennæ, which are moderately long, closely bipectinate in ♂, subsimple in ♀. Front broad hairy. Palpi long, slender, projecting beyond the front nearly half their length, basal joint clothed with long fringy hairs. Body parts smooth. Patagia small. Abdomen slender in ♂, terminating in a small anal tuft.

Anterior wings twice as long as broad. Costa straight; apex slightly rounded; outer margin oblique, slightly convex; inner angle distinct; inner margin straight, very convex at the base. Costal vein reaching the costa beyond the middle; subcostal 5-branched. 1st subcostal short, going rapidly to the costa; 2d rises a little beyond the discal vein, very short; 3d rises just beyond 2d and forks midway of its length, both branches going to the costa; 4th contiguous at its base to the 3d and goes to the outer margin; 5th rises on a short stalk at the discal vein, which is nearly obsolete. Median vein 4-branched. 1st and 2d nervules with common origin, 3d slightly removed from 2d, 4th distant.

Secondaries triangular. Costa slightly convex; outer angle rounded; outer margin nearly straight; anal angle rounded; inner margin straight and very long. Costal vein long, united at base to the subcostal. Subcostal vein bifurcate at the discal vein. 3d median nervule as far from the 2d as 2d from 1st. Submedian vein distant long. Internal vein long.

In the shape of the wings as well as in their coloration, this genus shows great variation in what are undoubtedly the same species, and appears to be extremely susceptible to local influences. Although I suspect that *Platarctia modesta*, Packard, belongs to this genus, and is not properly located, the following insects cannot be referred to *Platarctia*, which Mr. Packard describes as having the anterior wings proportionally broad, and the outer margin of the secondaries parallel with the costa. The present genus differs from *Nemeophila* in having longer palpi; the head and prothorax are more prominent; the head of Nemeophila is smooth and not crested in front, while the thorax and patagia are more hairy in the latter genus. In Nemeophila two

subcostal veins have their origin inside the discal vein, which is much stronger, while the 2d median nervule is as far from the 1st as from the 3d. Finally, the style of ornamentation is quite different, the anterior wings being obscure, and the posteriors destitute of discal spots.

The present genus includes insects of most difficult specific determination. After an examination of over sixty specimens I have decided to describe what appear to be three distinct forms, although I am by no means certain that subsequent investigation will not prove them all variations of the same insect. At present we merely know that these insects are all found in the same localities, on both sides of the Sierra Nevada Mountains, and very widely distributed over the Pacific Coast from Northern Oregon to Central California, and perhaps even further southward; the home of the genus, judging from the size and color of the specimens, being Oregon. The three species into which I have divided the specimens before me are clearly marked, though differing considerably even among themselves; but the circumstances under which they are found, and their extreme variability, strongly incline me to the belief that they are one and the same species, although the fact is not yet proved. Should they prove to be identical *L. Lena* must be retained as the specific name and the other forms noted as varieties.

Boisduval describes three varieties of this genus, two of them from individual specimens, as belonging to Lithosia (!) and includes with them in the same genus two species of Cisthene, though he subsequently says the three former "should perhaps be placed in a new genus near Nemeophila!" Such careless work is greatly to be regretted from the pen of the great entomologist, for if they were near *Nemeophila*, as they undoubtedly are, it would have been far better to include them in that genus, than in one with which they have no relation whatever. And here it may not be out of place to say, that so far as Boisduval's writings relate to Californian Bombycidæ, they are totally unreliable and liable to produce confusion, rather than to remove it. Many insects are included the occurrence of which there is much reason to doubt, and many species well known to American entomologists are described under new names.

The three species may be tabulated as follows:

Lower wings red	*L. decia.*
Lower wings yellow	*L. lena.*
Lower wings black	*L. dimidiata.*

1.—**LEPTARCTIA LENA.** (Pl. 5, figs. 3, 4, 5, 6, 11, 12, 13, 14, 16.)

Lithosia lena, Boisduval, Ann. Soc. Ent. Belg. vol. 12, p. 73 (1868-9).
Lithosia adnata, Boisduval, Ann. Soc. Ent. Belg. vol. 12, p 73 (1868-9).

♂ ♀.—Head and its appendages brownish black. Patagia, thorax and abdomen brownish black, the latter pale beneath and with a reddish lateral stripe. There is a narrow whitish line on the outside of the prothorax, a narrow whitish line on the patagia, and a few whitish scales on the vertex, sometimes more or less obsolete. Legs dusky, inside of femora pinkish, inside of tibiæ and tarsi yellowish.

Anterior wings dusky brown, crossed by three very obscure, irregular darker lines, basal, median and submarginal, frequently scarcely discernible. There is also a distinct whitish spot on the costa opposite the discal vein, an outer smaller costal spot of the same color, one at the anal angle, one on the inner margin, and a slender whitish streak at the base of the wing beneath the median vein. Fringes concolorous (see fig. 16). Sometimes a portion of the spots are obsolete (figs. 3 and 5) sometimes they are supplemented by a few smaller dots (fig. 11), without however greatly altering the appearance of the insect.

Posterior wings *yellow*, with a broad marginal band of black spots, sometimes distinctly isolated, sometimes partially fused (fig. 11), sometimes completely fused into an unbroken band (figs. 3 and 5). In some specimens there are traces of a blackish median band more or less complete (fig. 11), the inner margin and base being also frequently blackish, and from these specimens a regular gradation may be found until there remains of the yellow color, only a narrow median band (fig. 13). This obliteration of the yellow by the encroachment of the black, is confined chiefly to the ♂, the secondaries of the ♀ being unusually largely yellow.

Beneath, the primaries are yellowish, rather paler outwardly, dusky along the inner margin and at the apex, the apical cloud enclosing a small light costal spot. The secondaries usually are marked as above, but somewhat paler in color. Sometimes all the wings are crossed by a dark median band (fig. 14), sometimes the band is obsolete on the secondaries (fig. 4), sometimes it appears only as spots on the primaries (fig. 12), and frequently nothing remains except a dark spot on the costa of each wing (fig. 6). The gradations between these forms are innumerable, as scarcely any two specimens are exactly alike, and I have examined upwards of sixty.

A variety of the ♂ occurs in which all the parts which are yellow in the type, have a pale whitish tinge. It appears to be confined to specimens in which the dark colors preponderate as in fig. 13.

Expanse of wings, ♂ 1.15 to 1.30, ♀ 1.30 to 1.45 inches. *Length of body*, 0.45 to 0.55 inch.

Habitat.—California, (Edwards, Stretch, Behr, Behrens.) Nevada (Edwards), Oregon (Lord Walsingham).

A widely distributed insect, not uncommon where it is found, but somewhat local. It flies during the hot sunshine, in wooded districts in May. Boisduval's *Lithosia lena* and *L. adnata* are founded on varieties of this species. The former name is retained as having a wider range. I strongly suspect that *Pltaarctia modesta*, Packard, is one of the many varieties of this species, although a specimen forwarded to Dr. Packard was returned with the query, "what is it?" That it is congeneric is, I think, beyond doubt, as the peculiar thoracic markings are minutely given in the diagnosis of *P. modesta*.

The wonderful variations of this species, show how necessary it is to have a long series of many insects before it is possible to determine the limits of the species. It is possible to select three or four types of the insect under consideration, so unlike each other, that in the absence of the intermediate gradations they might readily be considered specifically distinct; it was indeed a long time before I could satisfy myself of their identity, especially as the shape of the primaries is by no means constant, but the past summer has supplied so many intermediate links that there can no longer be any reasonable doubt.

2.—LEPTARCTIA DECIA. (Pl. 5, figs. 1, 2, 15.)

Lithosia decia, Boisduval, Ann. Soc. Ent. Belg. vol. 12, p. 72 (1868–9).

♂.—Head and its appendages brownish black. Patagia, thorax and abdomen brownish black, the latter with a reddish lateral stripe. There is a narrow whitish line on the outside of the prothorax, a narrow whitish line on the patagia, and a few whitish scales on the vertex, sometimes more or less obsolete. Legs dusky, inside of femora pinkish, inside of tibiæ and tarsi yellowish.

Anterior wings reddish brown, sprinkled with grey scales, and crossed by three obscure, irregular darker lines, one subbasal, one median and the third submarginal. There is also a distinct whitish

spot on the costa opposite the discal vein, an outer smaller costal spot of the same color, one at the anal angle (often obsolete), one on the inner margin, and a slender whitish streak at the base of the wing beneath the median vein. Fringes concolorous.

Posterior wings *bright orange red*, dusky on the inner margin, with a broad blackish outer margin, which shows a tendency to break up into spots in many specimens. Fringes yellowish.

Beneath, all the wings are yellow, suffused with scarlet towards the base. On the posteriors the markings are reproduced only more dimly ; on the primaries the costa is whitish, and the apex and outer margin show a dusky cloud, enclosing a light costal spot near the apex.

♀.—Similar to the ♂ above, except that the secondaries are redder, while the base of the wings is largely blackish, and the black outer marginal band is produced along the costa to the base. Fringes of secondaries dusky. Beneath, the wings are entirely red, with faint orange tinges, the costa, apex, inner and outer margins being dusky brown, on the primaries. On the secondaries the black at the base disappears, otherwise the markings are as above, but of a brownish hue. In some Oregon specimens, all the shades are more intense (fig. 15), the whitish spots are fused into a whitish transverse band, while the secondaries are more largely and intensely black. Beneath, the primaries are as previously described, except that the margins of the wing are black instead of brown ; and the secondaries are so largely black, that the red color is reduced to a few broken median spots.

Expanse of wings, ♂ 1.15, ♀ 1.50 inches. *Length of body*, 0.45 to 0.50 inch.

Habitat.—Oregon (Lord Walsingham). California, (Edwards, Stretch.)

Boisduval's description of *Lithosia decia* corresponds very well with the insect described above, and I have no hesitation in retaining his specific name. This species appears to be common in Oregon, as evidenced by the long suite taken by Lord Walsingham, to whom I am indebted for the specimen figured on Plate 5, fig. 15. In California it is less abundant than either of its two allies, though like them widely distributed. Of its transformations nothing is known. The perfect insect appears in May, is single brooded, and not difficult to

take on the wing. It flies in the hot sunshine from ten to three o'clock.

3.—LEPTARCTIA DIMIDIATA. N. S. (Pl. 5, fig. 7, 8, 9, 10.)

♂.—Head and its appendages black. Patagia, thorax and abdomen black, the latter with faint traces of a red lateral line. There is a narrow whitish line in the outside of the prothorax, a narrow whitish line on the patagia and a few whitish scales on the vertex, sometimes more or less obsolete. Legs black, inside of femora rose colored.

Anterior wings smoky black, with four small whitish spots, the largest on the costa opposite the discal vein, the second midway between it and the apex, the third near the anal angle, the fourth being a narrow longitudinal streak under the median vein at the base of the wing. The smallest of these spots are often obsolete; there are often several additional minute dots on the apical half, and not unfrequently the spots are increased to a diffuse, irregular, transverse median band as in fig. 9. Fringes varying from dirty white to black.

Posterior wings black, darker than the primaries, immaculate, or with a small reddish discal dot. Fringes as on primaries.

Beneath the anterior wings are largely black at the base, with a black apical cloud narrowly produced along the outer margin, enclosing a small yellowish costal dot. The central portion of the wing is yellowish (fig. 8) or tinged with scarlet towards the base (fig. 9), but the yellow type is the more frequent. Secondaries entirely black. The coloration is more constant beneath than above.

♀ unknown.

Expanse of wings, 1.15 to 1.25 inches. *Length of body*, 0.45 inch.

Habitat.—California, (Coll. Edwards, Stretch.)

This species is not infrequent in the mountains both north and south of San Francisco; it is more abundant than *L. Decia*, but not so common as *L. Lena*, though found on the wing in company with, and generally in the same localities as the latter. Out of about forty specimens belonging to this genus taken in the same spot, and at the same time, about twenty per cent. were referable to the present species, all the remainder to *L. lena*. Like its congeners it is found in open wooded localities where the underbrush is thick, and probably feeds on low herbaceous plants.

6.—ARCTIA ACHAIA. (Pl. 5, figs. 17–21.) *

Arctia achaia, Grote, Tran. Am. Ent. Soc. vol. 1, p. 334. Pl. 6, fig. 45 ♂, 46 ♀. (1868.)

Chelonia Achaia, Boisduval, Lep. Cal. p. 76. (1868–9.)

♂.—Type. Pl. 5, fig. 19. Head between the eyes, pale yellowish buff. Labial palpi brownish black; eyes encircled with brownish black. Antennæ rather short, bipectinate, brownish black. "Collar" pale yellowish buff, with lateral black stripes behind the antennæ. Patagia black, fringed with pale yellowish buff; a central thoracic black stripe; the upper surface of the thorax (including the patagia) may thus be described as pale yellowish buff with three longitudinal black stripes. Beneath, the under thoracic surface and legs are blackish brown; the longer lateral hairs below the insertion of the wing are yellowish. Abdomen yellowish, blackish at the base. A broad black dorsal line, and a lateral row of small black spots. Beneath paler with two rows of small black transverse spots. Anal tuft black with a few yellowish hairs.

Anterior wings velvety black, the veins narrowly clothed with pale yellowish scales, as is also the costa. A broad, pale yellowish buff, longitudinal stripe, runs from the base of the wing below the median vein, to the internal angle where it forks, the branches reaching the outer margin and resting on the tips of the fourth median and submedian veins. A broad, similarly colored, sub-basal transverse band, spreading on the costal and internal margins, sometimes partially (fig. 10) and sometimes entirely obsolete (fig. 20). A narrow transverse, median, similarly colored band, usually constricted below the longitudinal stripe. A third transverse stripe, parallel with the outer margin, not seen below the longitudinal streak, and enclosing between it and the median band a wedge-shaped spot. Finally the usual arctian stripe making with the upper fork of the longitudinal stripe the letter W. Internal margin and fringes pale yellowish buff. Beneath as above, but less clearly marked. All the markings above are liable to great variation in color, being sometimes as described, sometimes creamy white, or ochreous or even rosy pink.

Posterior wings clear orange red marked as follows with black. A large basal patch, divided by a broad stripe medially and edged out-

* See p. 73, Ante.

wardly by the long yellowish fringes. A squarish spot on the discal vein, and three large submarginal spots, one near the apex, one near the anal angle, and the third intermediate. In addition to these, the apical half of the costa, and the outer margin are continuously black, the marginal band being toothed between the submarginal spots, and separated from them by very narrow spaces. Fringes yellowish. This pattern of ornamentation seems to be the most frequent, but no two specimens are exactly alike, and the black markings coalesce in every conceivable way, until all that remains of the ground color of the wings, is a median band with narrow rivulations running into the general black tint. In these dark colored specimens (fig. 20) the orange tint generally disappears and the color is deep red. Grote's figure and description of the ♂ appear to be drawn from an individual with a very small proportion of black on the posterior wings, the basal patch being obliterated, or rather represented by two median spots. Out of numerous specimens, I have seen but one which corresponds with this form, and it certainly cannot be considered typical. Except in very dark specimens, the black markings are usually edged very narrowly with ochreous.

♀.—In marking the ♀ resembles the ♂, though it is notably larger and the costa of the anterior wings is more convex. The markings on the primaries are frequently more intense in color, and the secondaries vary from ochreous red to scarlet, while at the same time the black markings show less tendency to coalesce. Fig. 17 shows a variety in which the markings of the primaries are largely obsolete, and the black spots on the secondaries have undergone partial coalition. Grote's figure of the ♀ conveys a very good idea of the insect, though rather too small.

Var. (Pl. 5, fig. 21.) *ochracea.* A very strongly marked variety of the ♂ occurs in which the posterior wings are clear ochre-yellow.

Expanse of wings, ♂ 1.65 ♀ 1.80 inches. *Length of body*, ♂ 0.80 ♀ 0.80 inch.

Habitat.—California. (Coll. Edwards, Behr, Behrens, Stretch.)

Larva.—Body black, with a double dorsal line, somewhat waved, dull reddish. Spines light brown, approaching to chestnut, paler at the tips, soft and silky in appearance. Feet and underside flesh color. Feeds on Trifolium, Erodium, Viola and Plantago.

Pupa.—Pale brown, covered with bluish efflorescence, similar to Catocula. Enclosed in very thin web, drab or stone color, through

which the chrysalis is distinctly seen. Larva found March 10; pupa, March 26; imago, May 16. (Henry Edwards.)

The insect appears to be widely distributed over California, though not common in the immediate neighborhood of San Francisco. The imago appears in May and comes freely to light.

7.—ARTICA VIRGO. (Pl. 6, figs. 1, 2, ♂.)

Bombyx virgo, Linn., Syst. Nat. 10th Ed. vol. 1, p. 501. (1758.)

Phalœna virgo, Smith, N. H. Lep. Ins. Ga. p. 123, Tab. 62. (1797.)

Euplagia virgo, Hübn., Samml. Exot. Schm. 2 pl. 189. (1806.) Verz. p. 180. (1816.)

Arctia virgo, Harris, Cat. Ins. Mass. p. 73. (1835.)

Arctia virgo, Duncan, Nat. Lib. vol. 36, pl. 19. (1836.)

Callimorpha parthenico, Kirby, Faun. Bor. Am. vol. 4, p. 204. (1837.)

Arctia virgo, Harris, Rt. Ins. Mass. p. 244. (1841.)

Arctia virgo, Walker, Cat. Lep. B. M. vol. 3, p. 608. (1855.)

Artica virgo, Clemens, Proc. Acad. Nat. Sci. Phil. p. 528. (1860.)

Arctia virgo, Morris, Syn. Lep. N. Am. App. p. 338. (1862.)

Arctia parthenice, Morris, Syn. Lep. N. Am. App. p. 339. (1862.)

Arctia parthenice, Saunders, Proc. Ent. Soc. Phil. vol. 2, p. 28. (1863.)

Arctia parthenice, Saunders, Syn. Can. Arct. p. 5. (1863.)

Arctia virgo, Saunders, Syn. Can. Arct. p. 6. (1863.)

Arctia virgo, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 115. (1864.)

Arctia parthenice, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 116. (1864.)

Arctia virgo, Grote, Proc. Ent. Soc. Phil. vol. 3, p. 325, pl. 4, fig. 4. (1864.)

♂. ♀.—Head, prothorax, patagia and thorax pale flesh color. The prothorax has two black spots; the thorax a central black streak, and the patagia are also black centrally. The palpi, thorax beneath and under side of the abdomen are black. The abdomen above is clear red with a dorsal series of black spots, most conspicuous in ♂. Legs generally black except the tibæ of the posterior pair, which are frequently whitish.

Anterior wings deep velvety black, all the veins diffusely striped with flesh color, which also prevails round the entire margin of the wings, most conspicuously so in the ♂. From the base of the wing, below the median vein, a broad flesh-colored stripe runs to the external margin, becoming distinctly furcate above the internal angle, and upon which, in the terminal half of the wing, rests a series of identically colored bands resembling the letter K with the straight stroke turned towards the base of the wing and bent, and the upper limb attaining the outer margin below the apex, and thence reflected to the costa between the transverse band and the apex; a broad straight band crosses the disc from the costa to the median vein, sometimes apparent in the interspace below the latter. The color of the foregoing markings varies from flesh color to dirty yellowish white, and they are broadest and most conspicuous in ♂.

The posterior wings are red, of a more or less pinkish shade, sometimes inclining to orange. They are marked with black spots, which vary considerably in size and number. When all present they are eight in number (fig. 1), viz.: one on the costa; a median row of three, consisting of a discal spot, one at the base of the 4th median, and one on the sub-median vein; and an outer row of four, consisting of one irregular fused spot at the apex, one on the 2d median, one on the 4th median, and one at the anal angle on the sub-median vein. The latter varies greatly in size in both sexes though always present; the costal spot and the inner spot of the median row are often absent, reducing the number to six; and the spots are generally larger and more intense in color in the ♀. The black spots are sometimes very narrowly edged with yellow ochre, more clearly so in ♂ than ♀.

Expanse of wings, 1.90–2.50 inches. *Length of body*, 0.80–0.90 inch.

Habitat.—Canada (Saunders). Eastern, Western and Southern States (Coll. generally).

Larva.—The following description is drawn up from a living larva kindly sent me by Wm. Saunders, Esq., of Ontario, Canada, as the larva of Arctia parthenice. Length, 1¾ inches. Head moderately large, bilobed, dark brown. Prolegs brown, abdominal legs dirty flesh color. Body deep rich blackish brown, almost black, rather paler beneath, with a narrow dorsal dirty flesh colored stripe, and the stigmata deep clear yellow. Body with six rows of prominent flesh-colored or yellowish tubercles on each side of the dorsal line, each tubercle carrying a bunch of radiate unequal stiff hairs. Row one is small,

round, placed on the front edge of each segment close to the dorsal line and carries black hairs; row two is larger ovate, placed transversely somewhat behind row one, and carries black hairs. These two rows are obsolete on segments 1, 2, 3 and 12. Row three is prominent, placed longitudinally, and carries mixed black and brown hairs, being obsolete on segment one. Rows four and five are prominent, carry reddish brown hairs and are obsolete on segment 12. Row six immediately above the feet, carries reddish brown hairs, and is present on all the segments. Segments 4, 5, 10 and 11 have each four small ventral tubercles carrying short hairs, and segment 12 has two. A few of the hairs of the anal segment are much longer than the others. Saunders states that the "larva hybernates when partly grown, and completes its growth the following spring. It feeds readily on lamb's quarter (*Chenopodiuu album*) or even grass." The imago appears from May to August (Packard), and is not a rare insect.

In relation to the mooted question of what insect was described by Kirby under the name of *Callimorpha parthenice*, I quote as follows from the pen of Mr. Grote, (Proc. Ent. Soc. Phil. vol. 3, p. 324,) believing the position there taken to be tenable: "Until Kirby in 1837 described, without figuring his *Callimorpha parthenice*, no second species nearly allied in coloration and ornamentation to *Arctia virgo* Linn. had been suspected by authors. Since Kirby wrote, this species has been sought for by Entomologists in a form of *A. virgo*, in which the series of spots on the posterior wings show a difference of size or position. I have elsewhere stated that I consider *A. parthenice* of authors as identical with *A. virgo* Linn., and since rearing imagos of both sexes from larvæ kindly sent me by Mr. William Saunders as the larvæ of *A. parthenice*, I see no reason for altering my opinion. While I have little hesitation in referring *A. parthenice* of Messrs. Saunders and Packard to *A. virgo* Linn., I am not so certain that *C. parthenice* of Kirby should be similarly referred. This author's description of the anterior wings equally applies to *A. virgo* Linn. with *A. Saundersii* Grote, and it is on the anterior wings more especially that I have seized upon a character which I believe is specific and will readily distinguish the latter species, viz.: the linearity of the stripes on the veins Kirby's description of the posterior wings, as well perhaps as the given expanse, would indicate *A. Saundersii* as the species intended, for in all my specimens the discal spots are absent and there are but five terminal spots, the expanse being $1\frac{1}{2}$ to $1\frac{3}{4}$ inches, Kirby giving the latter

EXPLANATION OF PLATE 5.

1.—Leptarcia decia, Boisduval ♀. - - California.
2.— " " " ♀ underside. - "
3.— " lena, " ♀. - - "
4.— " " " ♀ underside. - "
5.— " " " ♂. - - "
6.— " " " ♂ underside. - "
7. 9.— " dimidiata N. S. ♂. - - "
8. 10.— " " " ♂ underside. - "
11.— " lena, Boisduval ♀. - - "
12.— " " " ♀ underside. - "
13.— " " " ♂. - - "
14.— " " " ♂ underside. - "
15.— " decia, Boisduval ♀ var. - - "
16.— " lena, " ♂. - - "
17.—Arctia Achaia, Grote ♀ var. - - "
18.— " " " ♀. - - - "
19.— " " " ♂ type. - - "
20.— " " " ♂. - - - "
21.— " " " ♀ var. ochracea. - "


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measurement, while the discal spots are alwas present in my specimens of *A. virgo* Linn., and but few expand less than 2 inches."

"While, therefore, there is a probability that *A. Saundersii* was the species intended by Kirby, the unsatisfactory diagnosis, which contains no comparative allusion to Linnæus' species, renders it a matter of uncertainty, and I prefer to refer Kirby's description to *A. virgo* L., and to retain the name under which I have described it, for the second smaller species" (*A. Saundersii*).

BOMBYCIDÆ.

ARCTIINÆ.

Genus SPILOSOMA. Stephens.

Body parts stout; wings ample. Head and thoracic parts clothed with long hairs, obliterating the component parts. Head sunk in prothorax, scarcely visible from above. Eyes large; front long, rather narrow, tapering. Antennæ of moderate length, closely and evenly bipectinate in ♂, serrated or simple in ♀, each of the pectinations terminating in a strong seta. Palpi exceeding the front, porrect, subascendant, hairy at the base; terminal joint short. Abdomen stout, rather smooth, extending slightly beyond the hind wings. Legs stout, femora hairy; anterior tibiæ with long curved spur, closely appressed; middle tibiæ with two, hind tibiæ with four spurs at or near the apex of the joint.

Anterior wings twice as long as broad; costa nearly straight, apex rounded; outer margin hardly oblique, slightly rounded; anal angle rounded. 1st subcostal nervule rises interior to the discal vein; 2d and 3d go to the costa, the latter furcate at the tip; 4th continues from the origin of 3d to the outer margin; 5th arises on a short stalk at the origin of the discal vein, which is strongly angulated. Origin of the 1st and 2d median nervules slightly removed from the 3d.

Posterior wings full, with both the angles and the outer margin rounded. Costa slightly convex.

The colors of the genus are usually white or yellowish, with occasionally a few small black or brown markings. It has a wide geographical range. In America it is represented by four species, which may be tabulated as follows:

Anterior coxæ red.
- Wings immaculate, costa convex - - *S. latipennis.*
- Wings spotted with black, costa straight - - *S. vestalis.*

Anterior coxæ yellow.
- Wings white, a few black dots - - *S. virginica.*
- Wings white, brown markings - - - *S. congrua.*

1.—**SPILOSOMA VIRGINICA,** (Pl. 6, fig. 6 ♂.)

Bombyx virginica, Fabr.
Arctia virginica, Harris, Cat. Ins. Mass. Hitch, Rt. p. 591. (1833.)
Arctia virginica, Harris, Ins. Inj. Veg. p. 248. (1841).
Spliosoma virginica, Walk. Cat. Lep. B. M. vol. 3, p. 668. (1855.)
Spilosoma virginica, Fitch, 3rd Rep. Ins. N. Y. (1856.)
Spilosoma virginica, Clem., Proc. Acad. Nat. Sci. Phil. p. 531. (1860.)
Spilosoma virginica, Morris, Sym. Lep. N. Am. App. p. 342. (1862).
Arctia virginica, Harris, Ins. Inj. Veg. 3rd ed. fig. 168, larva 167. (1862.)
Spilosoma virginica, Saund., Syn. Can. Arct. p. 14. (1863.)
Spilosoma virginica, Pack., Proc. Ent. Soc. Phil. vol. 3, p. 125. (1864.)
Spilosoma virginica, Riley, 3rd Rep. Ins. Mo. p. 68, fig. 28, a. larva, b Pupa, c. imago. (1871.)

♂. ♀.—Head, prothorax, patagia and thorax, white, hairy, less so than in *S. vestalis*. Palpi white tinged with yellow beneath. Abdomen and thorax white beneath, the former orange yellow above, (except the last segment which is white) with a dorsal and lateral row of black spots. Legs white, tarsi sub-annulate with black, *coxæ* and *femora* of the anterior pair inwardly *orange yellow*, with a black dot at the base of the coxæ, another on the inside of the femora, the hips of the latter and the anterior edge of the tibiæ being also touched with black.

Wings pure white above and beneath. On the primaries there are two minute black dots, one at the base of the 3rd median nervule, and one between it and the margin. The secondaries have three larger black dots, one discal, one near the anal angle and one near the apex. These spots are seldom all present, those which are most frequently present being the discal dot on the primaries, and the anal spot on the secondaries. Beneath, the discal spot on the anterior wings is usually visible, while on the posterior wings the discal spot is more conspicuous and that at the anal angle is nearly always clearly defined.

Expanse of Wings, 1.70–1.90 inches : *length of body* 0.70 inch.
Habitat—Eastern States generally. California? (Coll. Stretch.)
Larva.—The following description is taken from Harris Ent. Corr.

p. 287. "Body cylindical, tuberculated, above straw colored with a lateral black line connected with transverse dorsal ones dividing the segments. Tubercles straw colored with black points and bundles of divaricating, pale straw colored hairs intermingled with a few black ones. Tubercles twelve on each segment, four dorsal and four lateral on each side, the lowest three approximated and situated beneath the stigma, which last is also beneath the lateral black lines, and just above the lateral fold. This fold is of a pale sulphureous color. Body beneath, and intermediate prolegs black. Head, feet, and prolegs and tips of the others pale ochreous. The tubercles are not situated in one transverse line, but of the dorsal ones the two upper are in front of the others; the upper lateral tubercle is above and in front of the spiracle, and the three under ones beneath and behind it. The hairs are of moderate length, and all barbed. Some larvæ of a dark rust color, with chestnut colored hairs also produced the same insect. ♀ ?"

Cocoon of silk interwoven with hairs. All the hairs are not used, so that the larva appears to be clothed with a few short ones. Riley says that but little silk is used in its construction, and that the hairs are held in place chiefly by their numerous barbs.

Pupa.—"Chestnut brown, darker behind. Three dilated furrows surround the middle of the posterior half. Tail blunt conic, terminated by a number of straight adminicula, abruptly ending in a hook at their apices."

These larvæ, popularly known as "Yellow bears," feed on a great variety of plants. Harris mentions the plantain, and Riley enumerates the grape-vine, butternut, lilac, beans, peas, convolvulus, corn, currant, gooseberry, cotton, sunflower, verbenas, geranium, etc., and that they are even carnivorous. The last author also states that there are two broods each year, the broods intermixing, and the last passing the winter in the chrysalis state. The imago appears on the wing from May to August, and is one of the commonest species. (Riley and Harris.)

While this insect is undoubtedly most at home east of the Rocky Mountains, I have one imperfect specimen taken in California by Mr. Lorquin, which I am unable to separate by any good specific characters from the insect under consideration. Its imperfect condition does not admit of a satisfactory comparison, but it differs principally in the number of spots on the posterior wings, where the anal and apical dots have each a supplementary dot, faintly visible above but clearly

marked beneath, making a submarginal row of four spots, with a fifth less strongly marked near the costa. I have yet to see an eastern specimen exhibiting this coloration, but in the absence of knowledge of the preparatory stages I have deemed it best for the present, to refer the specimen to *S. virginica*. *S. virginica* is abundantly separated from *S. vestalis* and *latipennis* by the color of the anterior legs, as well as by the want of the silvery gloss on the wings of the two latter species. Its nearest ally is *S. urticæ* of Europe, which wants the black spots on the secondaries and is much less purely white, while the body is shorter and stouter with the black dorsal spots less strongly marked.

2—SPILOSOMA LATIPENNIS, N. S (Pl. 6, fig. 5., ♀)

♀. White. Head, thorax and patagia white. Eyes black. Palpi brownish, white beneath. Legs white, with the *coxæ* and *femora* of the anterior pair *bright pink* inwardly; tibiæ and tarsi of the same pair black inwardly, white outwardly.

All the wings are pure silky white, immaculate. The costa of the primaries is *decidedly convex* from the base to the apex.

Expanse of Wings, ♀ 1.75 inches; *length of body*, 0.70 inch.

Habitat.—Atlantic States (Angus.) (Coll. Stretch.)

Described from one imperfect broken ♀ (wanting the body) received from Mr. James Angus, of West Farm, N Y., without any definite locality attached to the specimen. The specimen, though broken, is clearly not to be referred to any North American species hitherto described. While the *red* coxæ show its relationship to *S. vestalis* the convex costa, which makes the wings proportionately broad, and the slenderer, less hair thorax, abundantly separate it from that species. From *S. virginica* it may be distinguished not only by the color of the anterior coxæ, but by the peculiar glossy, silky shade of the wings, which in this respect more resemble *S. vestalis*. From *S. congrua* it is separated by the immaculate wings.

3—SPILOSOMA VESTALIS, (Pl. 6, fig. 7 ♂, 8 ♀.)

Spilosoma vestalis, Packard, Proc. Ent. Soc. Phil. vol. 3, p. . (1864.)

♂. White. Head, prothorax, thorax and patagia white densely clothed with long hairs, so that the individual parts are not

clearly distinguishable. Eyes black. Palpi brownish black. Antennæ white, pectinations black, Abdomen white, with a lateral row of black spots, clothed with long hairs above, which almost obscure a series of dusky transverse markings. Legs white, tarsi dusky; the anterior pair have the *coxæ and femora* clothed with *bright red* hairs inwardly, while the tibiæ and tarsi are black on the front edge.

Anterior wings pure silky white, with the *costa very straight*, and four indistinct transverse rows of very minute black dots, many of which are frequently wanting. The 1st is basal and generally consists of three dots, one on the costa, one on the median, and one on the submedian vein; the 2nd consists of four dots, one of which lies at the base of the 4th median nervule; the 3rd row lies across the nervules and consists of geminate spots on each nervule; the 4th is submarginal and very indistinct.

The posterior wings are also pure silky white, with a discal dot, and traces of a submarginal row all black, the latter being indicated by a dot near the anal angle, and another on the outer margin near the apex, both of the latter being sometimes supplemented with minor dots. The three principal dots are larger than any on the anterior wings.

Beneath pure white; the principal black dots present, being two on the costa and one on the discal vein on the primaries; one on the costa, one on the discal vein and one near the anal angle on the secondaries.

♀. The female resembles the male except that it is larger, with fewer black dots on the wings, and wants the long white hair on the abdomen, which consequently shows the four black transverse bands, and the black central spot on the terminal segment very distinctly.

Expanse of Wings, ♂ 1.75 ♀ 1.90 inches; *length of body*, ♂ 0.70 ♀ 0.80 inch.

Habitat.—California. (Coll. Edwards, Behr, Stretch, Strecker, Mus. Comp. Zoöl. Cambridge.)

This beautiful species does not appear to be rare in the neighborhood of San Francisco where it is found in May. The larva feeds on a species of Echinocistus, and though common, is exceedingly difficult to raise, as they almost always die about the third moulting. In its early stages the larva has a general olive greenish tint, as I am informed by Mr. H. Edwards. The imago is frequently attracted by the house and street lights.

3—HALESIDOTA SOBRINA, N. S. (Pl. 6, fig, 10 ♂.)*

♂. Head, palpi, prothorax, thorax and legs clear brown. Abdomen paler. Antennæ strongly pectinated, rather paler than thorax.

Anterior wings uniform clear brown, the veins paler, with five more or less complete oblique rows of white silvery spots. The 1st row consists of 1 spot on the costa near the base. The 2nd of 2 spots below the median vein. The 3rd of 4 spots, one near the costa, very small; one on the discal area, large; one at the origin of the fourth median nervule, small; and one in the interspace below the median vein, rather smaller than the second. The 4th row consists of 5 subequal, ovate, transverse, interspaceal spots, reaching the costa. The 5th row consists of 6 smaller, interspaceal, submarginal spots, diminishing in size from the anal angle to the apex.

Posterior wings subdiaphanous, nearly white, with a pale brown spot on the discal vein, and a small brown apical cloud. Costa slightly yellowish.

Beneath much as above, except that the markings of the primaries are less distinct, and the costa of the secondaries is brown, enclosing a pale costal spot.

Expanse of Wings, 1.95 inches; *length of body,* 0.80 inch.

Habitat.—California. (Coll. Stretch.)

Described from one ♂, collected by Mr. Lorquin, some years since, but in what particular locality he does not remember. It may be readily distinguished from *H. argentata* by the uniform dark brown of the body parts, and by the pale veins and absence of yellowish powdery scales on the primaries.

4—HALESIDOTA ARGENTATA, (Pl. 6, fig. 12. ♀,)

Halesidota argentata, Packard, Proc. Ent. Soc. Phil. III, p. 129. (1864.)

♂. ♀.—Head and prothorax very pale yellowish ochre, the latter with two small brown spots. Patagia same edged inwardly with brown. Thorax the same with brown median stripe. Palpi brown, pale at the tips and beneath. Abdomen concolorous with thorax, quite pale,

* See page 87, ante.

stigmata dark brown, a ventral and two sub-ventral rows of pale brown spots. Legs pale yellow ochre mottled with brown.

Anterior wings clear brown finely dusted in the interspaces with pale yellow ochre, which color also prevails in the brown fringes, at the tips of the nervules. Five yellowish costal spots, each belonging to a transverse oblique band of large silvery white spots. Band 1 is submarginal, consisting of seven interspaceal sub-equal spots, and is very regular; band 2, crossing the origin of the median nervules, consists of seven spots, the last being on the inner margin, the 3rd spot is very small, the 4th somewhat larger, the 1st, 2nd, 5th and 6th large and conspicuous; band 3 consists of three spots, 1st on discal area, 2nd and 3rd fused to spots 5 and 6 of band 2; band 4 is sub-basal, consisting of four or five minor spots; band 5 is not well defined, the base of the wing being mottled with many small spots.

Posterior wings nearly white, thin, with faint brown spot on the discal vein and a small apical cloud of the same color.

Beneath much as above, though paler, especially at the base of the primaries. There is also a dark costal spot on the secondaries not seen above.

Expanse of Wings, ♂ 2.00 ♀ 2.30 inches; *length of body*, 0.80 0.90 inch.

Habitat.—California. (Coll. Behr. Behrens, Mus. Comp. Zoöl. Camb.)

Described from one ♂ ♀ in the collection of Dr. Behr, of San Francisco, raised from larva found feeding on pine leaves in the Sierra Nevada Mountains, near Grass Valley. Of these I unfortunately have no description, but they were dark brown, somewhat resembling the larva of *H. Edwardsii*. Mr. H. Edwards also found a larva in Yosemite Valley, which died before reaching maturity, apparently belonging to the same species, while the original type was collected by Mr. Agassiz in the Gulf of Georgia, so that the species will be seen to have a wide range, and is apparently a mountain insect, differing in this respect from *H. Agassizii* and *H. Edwardsii*, which are common in the valleys. The specie is well marked and not likely to be mistaken for any other, without it might be *H. Sobrina* (q. v.) From this it may be easily separated by the light colored body parts marked on the thorax with dark brown. These in the latter species are uniformly dark brown.

5—HALESIDOTA TESSELLARIS, (Pl. 6, fig. 9, ♀.)

Phalæna tessellaris, Smith, N. H. Lep. Ins. Georgia, p. 149. (1797.)
Halesidota tessellaris, Hübn, Verz. p. 170. (1816.)
Arctia tessellaris, Harris, Cat. Ins. Mass. Hitchcocks' Rt. p. 592. (1833.)
Halesidota tessellaris, Hübn. Geyer's Forts. Hübn. Zutr. Dritt. Hund. p. 34, fig. 939, 940. (1837.)
Lophocampa tessellaris, Harris, Rt. Ins. Mass. p. 260. (1841.)
Halesidota tessellaris, Walk., Cat. Lep. B. M. V. p. 732. (1855.)
Halesidota tessellaris, Clem., Proc. Acad. Nat. Sci. Phil. p. 534. (1860.)
Halesidota tessellaris, Morris, Syn. Lep. N. Am. App. p. 348. (1863.)
Halesidota tessellaris, Saunders, Syn. Can. Arct. p. 19. (1863.)
Halesidota antiphola, Walsh, Proc. Bost. Soc. N. H. IX, p. 288. (1864.)
Halesidota tessellaris, Pack., Proc. Ent. Soc. Phil. vol. 3, p. 128 (1864.)
Halesidota antiphola, Pack., Proc. Ent. Soc. Phil. vol. 3, p. 128 (1864.)
Halesidota Harrisii, Walsh, Proc. Ent. Soc. Phil. vol. 3, p. 430. (1864.)

♂. ♀.—Head prothorax and patagia pale yellow ochre, the latter narrowly edged inwardly with blueish green. Thorax and abdomen above darker, beneath paler. Legs concolorous with thorax.

Anterior wings subdiaphanous, very thinly scaled, very pale ochreous, with five irregular, slightly darker, somewhat dusky bands, very narrowly and neatly edged with black. The 1st band is sub-basal, reaching only to the sub-median vein; the 2nd lies across the base of the fourth median nervule, reaches from the costa to the inner margin, and is somewhat sinuate in the discal area; the 3rd is on the discal vein and reaches only from the costa to the median vein; the 4th is submarginal, sinuate, somewhat widest on the inner margin which is reached at the anal angle; the 5th is marginal with an irregular inner edge, and diminishes in width from the apex to anal angle.

Secondaries immaculate, nearly white, suffused with pale ochre on the inner margin.

Beneath as above, except that the markings on the primaries are very indistinct.

Expanse of Wings, 1.90 inches; *length of body*, 0.70 inch.

Habitat.—Atlantic and Western States. (Coll. generally.) Canada. (Saunders.)

Larva.—Head black, polished, the mouth varied with white. Body opaque, black above, pale on the venter, covered above with dense hairs proceeding from little warts in evenly shorn brushes or tufts, which are dorsally a little darker, and vary in color in different specimens from dirty whitish or occasionally almost pure white to fuscous cinereous, and from pale gamboge-yellowish to ochre-yellowish and pale yellowish-brown, the brushes on the back converging so as to form a dense dorsal ridge. On the 2nd segment behind the head one lateral black pencil and two milk-white ones under it, all transversely arranged, the black pencils generally in repose directed horizontally forwards. On the 3rd segment one lateral black pencil and one milk-white one under it, directed obliquely forward. On the 11th segment one lateral black pencil directed obliquely backwards, and on the 12th segment one less obvious pencil, which is either whitish or the color of the tufts of the body, placed immediately behind the black pencil on the 11th segment, and often with a few long black hairs above it. Besides the pencils, there are also some long whitish hairs projecting forwards over the head, and backwards over the anus. Legs and prolegs very pale ferruginous, slightly obfuscated at tips. When much less than half grown, the head is generally not black but rufous, the black pencil on the 2nd segment is often only slightly tinged with black, and the pencils on the 11th and 12th segments are occasionally subobsolete, or all whitish and untinged with black. Food-plants, oak, basswood, elm, etc. (Dr. Walsh, Proc. Ent. Soc. Phil. vol. 3, p. 413.)

This is the larva of *H. antiphola*, Walsh.

Larva var.—The larva sometimes has the head rufous; the body yellowish-white, with the warts and a ring round each spiracle brown black; the hair-tufts milk-white, the two middle pencils on segments 2 and 3 orange color, and the two pencils on segment 11 milk-white. This variety is found feeding on the sycamore and is Dr. Walsh's phytophagic variety *H. Harrisii*. (Proc. Ent. Soc. Phil. vol 5, p. 199.)

In the various papers from which the above quotations have been made Dr. Walsh has labored earnestly to make two species out of

H. tessellaris, Sm. Abbott, which he calls *phytophagic* species, and which are founded on a varying color of the hair, pencils and a different food plant. If these larval differences were accompanied by differences in the imago, the position would be tenable, but this author admits the absolute identity of the imagines raised from larvæ of both classes of coloration. It seems then, that however pertinent these observations may be to the question of the origin of species, the contingencies of the early life of the larva have as yet produced no result upon the imago, and until such proves to be the case we are scarcely warranted in creating new species on differences in larval coloration. Indeed, the position taken by Dr. Walsh is not yet proven. He does not show that larvæ raised on the Sycamore, produce imagines, the eggs from which evolve identical larvæ, and similarly of larvæ raised on the oak. While not absolutely establishing his proposition, this would have materially strengthened his argument, but it does not appear that this phase of the experiment was ever undertaken. I cannot better sum up this question than in the words of Mr. Grote, who says, (Proc. Ent. Soc. Phil. vol. 3, p. 536), in relation to *H. antiphola*, Walsh, "The validity of the supposed species rests upon a stated difference of larval structure affecting the location of the 'hair pencils,' a different coloration of the latter and a varying food plant. Subsequent investigation, I am informed, has contradicted the first of these asserted differences, which indeed, on the supposition that it existed, would rather indicate a generic than a specific character, and I consequently omit any further remarks upon it. There remains then a differing coloration of the larval 'hair pencils' and a differing food plant as the totality of specific characters which are to constitute the new species. Analagous instances of larval variation in the coloring of the 'hair' among members of the present family have been discovered without having been made the basis for the description of a new species, and may be correctly regarded as simple variations within the 'well defined limits of the species,' while the habits of the differing larvæ as to the food plant, especially in such an essentially polyphagous family as the Arctiidæ, can with difficulty be drawn in as a specific character, even upon much more perfect and detailed evidence than Mr. Walsh has offered in the present instance. * * * It is not the most inconsistent part of Mr. Walsh's paper, that while *H. antiphola* is published as 'N. Sp.,' it is regarded on page 298, (Proc. Boston Soc. Nat. Hist. February, 1864,) as merely in process of 'formation.' No

such forms have been hitherto announced in Entomological Science, and a specific name in its present acceptation is only improperly to be applied to them,"

This species is widely distributed, and feeds on a large variety of forest trees as previously quoted. It appears on the wing in June, July and August; the larvæ hatched in autum pass the winter as pupæ and are evolved in the following summer.

6—HALESIDOTA CARYÆ, (Pl. 6, fig. 11, ♂.)

Lophocampa caryæ, Harris, Rt. Ins. Mass. p. 258. (1841.)
Lophocampa caryæ, Fitch, First Rt. Ins. N. Y. p. 159, fig. *larva*. (1855.)
Halesidota annulifascia, Walk., Cat. Lep. B. M. V. p. 734. (1855.)
Phegoptera porphyria, H. S., Lep. Exot. Sp. Nov. fig. 283. (1855.)
Halesidota porphyria, H. S. Lep. Exot. Sp. Nov. fig. 283. (1858.)
Halesidota caryæ, Clem., Proc. Acad. Nat. Sci. Phil. p. 533. (1860.)
Halesidota annulifascia, Clem., Proc. Acad. Nat. Sci. Phil. p. 533. (1860.)
Halesidota caryæ, Morris, Syn. Lep. N. Am. App. p. 349. (1862.)
Halesidota annulifascia, Morris. Syn. Lep. N. Am. App. p. 349. (1862.)
Halesidota caryæ, Saunders, Syn. Can. Arct. p. 20. (1863.)
Halesidota caryæ, Packard, Proc. Ent. Soc. Phil. vol. 8, p. 128. (1864.)

♂. ♀.—Ochre yellow with silvery white spots. Head, thoracic parts, and abdomen above pale ochre yellow, somewhat paler beneath. Head with transverse band in front, prothorax with small dots, and inner edges of the patagia all brown.

Anterior wings clear ochre yellow, dusted with dark brown, most densely so round the spots. Five oblique transverse rows of silvery white spots, those on the costa and at the base slightly tinged with yellow. The 1st row consists of a basal patch, connected on the inner margin with the irregular sub-basal 2nd band. The 3rd row lies across the base of the fourth median nervule and is widest on the costa; the 4th lies across the base of the median nervules, is slightly irregular, with the costal spot largest; the 5th is submarginal, spots sub-equal, *ovate*, the second spot from the costa somewhat nearer the

outer margin than those adjacent. There is in addition a square spot on the discal area, one on the costa opposite to it, besides a very small one at the junction of the discal vein with the median nervules. The extreme apex of the wing is clear ochre yellow; the veins, especially the fourth median and the last sub-costal, being dark brown, while the latter color prevails extensively around the discal vein and on the outer margin below the apex. Fringes brown, interrupted with yellowish at the termination of the nervules.

Secondaries very pale yellowish white, sub-diaphanous, immaculate, clothed with yellowish hairs on the inner margin.

Beneath much as above, but less strongly marked, there being in addition two small brown spots on the costa of the secondaries.

Expanse of Wings, 1.90 inches; *length of body*, 0.75 inch.

Habitat.—Atlantic States. (Coll. generally.) Canada. (Saunders.)

Larva.—(Harris' Corr. p. 289.) Body satin white above, dusky beneath, head and true feet black, prolegs dusky; sides of the body spotted with black, and with black tubercles emitting stellated or divaricating white hairs, the two dorsal series short, truncated and converging, and of a black color from the fourth to the eleventh segments inclusive; two black pencils on the fourth and tenth segments and a dorsal series of black spots from the fourth to the eleventh segments; on all these segments the dorsal tubercles are in a double series, viz: two before, nearer together than the others—one-half of the hairs from which are black, and converge in a tuft on the back, and the other hairs are white; two others more distant, and furnishing only divaricating white hairs. These four dorsal tubercles are transverse, or very elongated (almost linear) oval; the tubercles on the sides are hemispherical. The white hairs on the first three segments, and on the two last, are longer than the rest, and those on the sides of the body are longer than those on the back. The black pencils on the fourth and tenth segments, are longest of all. Rolls up when touched. Aug. 28th.

"Sept. 18, 1840. Larva white, covered with white hairs in short spreading tufts, a row of eight black tufts on the back, beginning on the fourth segment; two long, black, pencil-like tufts on the fourth and tenth segment; four white pencils on the second and third, and two on the eleventh and twelfth segments. Head and prolegs black; the surface of the body with minute black tubercles, and a transverse black line between each segment. It varies in having the tufts of hair each side of the dorsal black series dusky."

"July 15th, 1842. On the last leaf of a branch of *Tilia Americana* found a swarm of these caterpillars just hatched. The eggs were laid on the under side of the leaf, forming a broad patch an inch in diameter. On the 23rd examined the swarm again; the caterpillars were a quarter of an inch long. The little black dorsal tufts were visible, though small; the other hairs thin and permitting the skin and tubercles to be easily seen. The insects were all together, as thick as possible, side by side on the lower surface of a leaf. They had eaten all the parenchyma of the terminal leaves of the twig, leaving only the veins and intervening reticulations. They had spun a few threads, forming a very slight and hardly conspicuous web on the leaves and twig, probably in moving about, and not for a shelter. When first found these caterpillars were mistaken for *Hyphantria textor*, a circumstance which tends to show that these species should stand near each other in a natural arrangement."

This species is widely distributed through the Northern States, appearing on the wing in June and July. Its characteristic food plant, and the one from which it takes its specific name is the *Carya porcina*, though it it not exclusively confined to that tree. It is very closely allied to a species from Costa Rica (undetermined) which is so similar that at first sight it might be easily taken to be identical. The latter is somewhat larger and paler; the markings similar in position, but the shape and disposition of the spots in the sub-marginal band is different, the spots being distinctly *cordate* and less regular in their distance from the outer margin.

BOMBYCIDÆ.

CERATOCAMPINÆ.

Genus. **EULEUCOPHÆUS.** Packard.

"This is a singular genus closely allied to *Hemileuca*, especially the section represented by *H. Juno*, with which the present genus may be compared. The body, including the antennæ, is large, while the wings are much smaller than usual. The antennæ are large, broadly pectinated to the tip, just as in *Hemileuca*, and the body is of the same size and structure as in *H. Juno*. The forewings are much as in *H. Juno*, but proportionately smaller, the costa being slightly sinuate, incurved in the middle, the apex being much rounded just as in *H. Juno*, and the outer and inner edges having also the same proportions. The hind wings are much shorter and rounder than in *Hemileuca*, the tip of the abdomen projecting (slightly) beyond them; the apex is much more rounded. The venation differs in the second median venule arising from within the middle of the wing, especially in the hind wings; in *H. Juno* it arises outside the middle of the wing. The style of coloration is quite different, there being no discal spot on the hind wings, which are pale whitish yellow (testaceous.)

The generic name is given in allusion to the pale gray color so unusual in this sub-family."

Packard, Ann. Rep. Peab. Acad. Sci. April, 1872.

This genus includes but one species, *E. tricolor* from New Mexico. Mr. Packard was not acquainted with the ♀ of the species described by him, and was consequently not aware of the great disparity in size between the sexes, which in addition to the difference in coloration might almost lead to the supposition that they were two distinct species.

1—EULEUCOPHÆUS TRICOLOR, (Pl. 6 fig., 3 ♂ ♀ 4.)

Euleucophœus tricolor, Packard, Rep. Peab. Acad. Sci. April, 1872.

♂.—Head, thorax beneath and abdomen above dark indian red; prothorax patagia and thorax very hairy, grayish brown, with scattered yellowish hairs. Abdomen beneath, brown, banded with pale ochre.

Antennæ pale rust red. Legs yellowish, clothed with long grayish brown hairs.

Anterior wings blackish brown sprinkled with dirty white scales. A basal, dirty white, oblique band angulated near the costa; a transverse, oblique, band beyond the middle, parallel with the outer margin, and of the same color; and finally a narrow marginal band of the same color. Fringes concolorous. The gray coloring thus becomes a basal cloud; a mesial band somewhat broadest on the costa, palest in the centre, and carrying a whitish transverse lunate black bordered discal spot; and a more diffuse, sub-marginal cloud, which does not reach either the costal, inner or outer margins.

Posterior wings pale yellowish white, immaculate, somewhat tinged with yellowish on the inner margin.

Beneath, the markings of the primaries reappear but more faintly, the base of the costa being clothed with carneous hairs; secondaries as above, a few carneous hairs at the base.

♀.—Much larger than ♂, costa of the primaries slightly convex. The whitish markings are reduced to a narrow angulated sub-basal band, somewhat spread on the costa, and a narrow oblique band of the same color from the inner margin to the costa near the apex. Fringes whitish. Discal spot distinct. Secondaries pale carneous, with a lighter extra mesial band. Otherwise similar to ♂.

Expanse of Wings, ♂ 2.00 ♀ 2.70 inches; *length of body*, ♂ 0.85 inch ♀ 1.10 inches.

Habitat.—New Mexico. (Coll. Dr. Behr, H. Edwards, R. H. Stretch.)

For my type of this species I am indebted to the kindness of Dr. Behr, of San Francisco, in whose collection the only ♀ at present known, is to be found. Six ♂ specimens show no tendency to variation. All the known specimens were collected by Dr. Howard who states that they were found round Mesquite trees, from which it may be inferred that the larva feeds on that plant. Of the nature of the country in which the insect was taken we know nothing. On this point Mr. A. S. Packard says: "Whether the unusually pale color of this species is to adapt it for concealment in dry and desert localities or not, we can only learn when we know something ot the habits of the moth."

EXPLANATION OF PLATE 6.

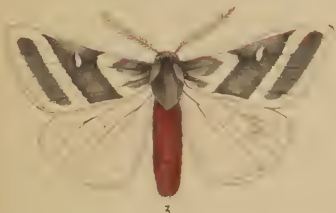
1.—Arctia virgo, Linn. ♂. - - - Atlantic States.
2.— " " " ♂. - - - - "
3.—Euleucophæus tricolor, Packard ♂. - - New Mexico.
4.— " " " ♀. - - "
5.—Spilosoma latipennis N. S. ♀. - - California.
6.— " virginica, Fabr. ♀. - - Atlantic States.
7.— " vestalis, Packard ♂. - - California.
8.— " " " ♀. - - "
9.—Halesidota tessellaris, Smith ♀. - - Atlantic States.
10.— " sobrina, N. S. ♂. - - - California.
11.— " caryæ, Harris ♀. - - Atlantic States.
12.— " argentata, Packard ♀. - - California



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12



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8

ZYGÆNIDÆ.

CASTNIINÆ.

Genus. **EUDRYAS.** Boisduval.

"Head rather large, eyes and ocelli large and full. Antennæ not thickened in the middle, with short lateral setæ in the male and pubescent beneath. Front prominent, densely pilose, though the hairs hardly conceal the conical clypeal tubercle, which last is very large and truncated at the apex. The clypeus in front is square. Palpi large, porrect; two basal joints evenly pilose to the tip of the second. Third joint small, cylindrical, short, porrect reaching nearly one-half its length beyond the front.

"Thorax pilose, with a broad median crest of metallic-colored scales, succeded by a dorsal row of similar tufts upon the basal half of the abdomen which diminish in size from the thorax.

"Wings shaped as in *alypia*, but the primaries are more rounded at the apex, internal angle rounder. The nervules are nearly continuous with the direction of the main branches. Subcostal nervules long, first subcostal arising one-third of the distance out to the apex of the wing. The hind wings hardly reach to the outer fourth of the abdomen, being much as in *alypia*. Outer margin a little scolloped below the apex, below straight and parallel with the costa of the primaries. Discoidal nervules situated within the middle of the wing. The femora and tibiæ of the fore-legs are very pilose, forming a dense tuft projecting in a mass over the first tarsal joint. Hind pair of legs stout, with longer tibial spines than in *alypia*.

"*Larva*. The head is of good size, being three-fourths as wide as the body. It is nearly as broad across the vertex, as in front, above it is rather deeply impressed by the median line. The V-shaped epicranium is large, not sunken below the level of the front; its apex is rather blunt, its sides bulge out from the apex to the anterior third of its length, where it is slightly contracted; and where it joins the clypeus its edge is linear. The short transverse clypeus is as broad as the epicranium is long, its front edge being straight and very slightly raised.

"The labrum is divided half of its length by a sinus, into two lobes

which are farther subdivided into two portions, the outer corneous and hard, and shaped somewhat like the mandible of the mature moths of this family, while the inner portions meet on the median line and are more fleshy.

"The two jointed antennæ are placed directly opposite the thick subtriangular truncated mandibles.

"The labium and basal portion of the maxillæ are broad and thick.

"The body is elongated and gradually increases in width to the eighth ring, which is much enlarged and raised into a hump, from which the body rapidly narrows, and the tergum falls down at an angle of 45° to the broad lunate supra-anal plate.

"The rings are slightly convex; across their middle is a row of tubercles ending in hairs equal in length to that of the ring itself. Upon the tergum of each ring are four large tubercles arranged in a broad trapezoid, two in front and two more distant, on the middle of the ring; on the thoracic rings these tubercles are arranged in a single transverse line and on the supra-anal plate in a square. Below is a lateral row of similar warts, one for each ring, immediately below which is a row of stigmata, behind which on each ring is a minute wart. On the pleural line of the body, formed by the triangular raised portion of the side of each ring is a tubercle; and at the base of all the legs is a single similar wart. On the sternal side of the body, on the segments between the legs, is a transverse row of smaller warts than those above, which are inclined to be germinate between the true and false legs. There is a distinct thickening of the skin on the sides of the anal legs as in the Bombyces.

"The coloration of the body generally is a light hue, with linear transverse tergal stripes, about six for each ring, and nearly black in color, which are interrupted near or between the tubercles."

Pupa. "The whole body is elongate and rather slender; both the head and prothorax taper continuously towards the clypeal tubercle, which is quite prominent. The antennæ do not reach to the end of the wings. The prothorax is twice as broad as long; slightly carinated. The sides of the body are continuous and straight from the base of the wings to the fourth abdominal ring, while the body itself is hardly depressed or constricted at the juncture of the thorax and abdomen. The wings meet upon the sternum, reaching to the middle of the body. Fifth to seventh rings of the abdomen separated by deep sutures, while the surface of each ring is flat, not convex, with two rows of small

teeth ; while lower down on the sides of the body are four tubercles, being the remnants of the two middle pairs of prop legs. The remaining rings are less angulated. The tip of the abdomen is obtusely conical, ending in four tubercles, the pair above long and truncate, those below broad and short. On the under side are two minute approximate tubercles. The whole chrysalis is of a dark mahogany brown, with the surface finely granulated."

Packard, Proc. Essex Inst. vol. 4, April 1864.

The proper location of this somewhat anomalous genus has been the subject of extensive discussion. Dr. Harris located it near *Notodonta*, while Walker refers it to the *Noctuidæ*. Mr. Doubleday in his letters to Dr. Harris, states that Westwood saw in its structure certain affinities with *Callimorpha*, while Boisduval transferred it to the *Zygænidæ*. The notes on the Family Zygænidæ by Dr. Packard, from which the above generic characters are extracted, were written with the object of showing the "systematic position of the genus, and are well worthy the careful study of Entomologists. The two Eastern species are well known ; a third from California must be added to the list. They may be tabulated thus :

Discal spot on secondaries - - - -	*E. brevipennis.*
No discal spot on secondaries	
Outer margin of primaries dark with single pale line - -	*E. grata.*
Outer margins of primaries pale mottled with darker - -	*E. unio.*

1—EUDRYAS GRATA. (Pl. 7, fig. 1,)

Bombyx grata, Fabr., Ent. Syst. III. 457.
Cyphocampa grata, Harris. M. S. S.
Eudryas grata, Boisd., Spec. Gen. Lep. vol. 1., pl. 14. (1836.)
Eudryas grata, Harris, Ins. Inj. Veg. p. 310. (1841.)
Eudryas grata, Walker, Cat. Lep. B. M., vol. 9. (1856.)
Eudryas grata, Morris, Syn. Lep. N. Am. p. 245. (1860.)
Eudryas grata, Harris, Ins. Inj. Veg. p. 427. Pl. 6, fig. 8. (1862.)
Eudryas grata, Harris Corr. p. 306. (1869) *larva*.
Eudryas grata, Riley, 2nd Rep. St. Ent. Missouri, p. 83, fig. 56. (1870.)

♂. ♀.—Head and prothorax dark purplish brown, with many metallic blueish scales. Palpi paler. Patagia white. Thorax white, with a broad median stripe concolorous with prothorax. Abdomen yellow ochre, with a dorsal series of tufts concolorous with prothorax, the basal tuft large, the others rapidly diminishing in size towards the tip. Abdomen beneath, yellowish with a lateral series of black spots. Fore legs white, tibial tuft dusky; other legs dusky.

Anterior wings white with a broad marginal outer band of a rich purplish chocolate color, margined internally with a narrow olive green band, which is pale centrally. In this band on the outer margin, there is a very narrow sinuate blueish white line, supplemented inwardly with a few powdery blue scales. A dusky reniform discal spot, pale olive green centrally. The costa from the base to this reniform spot is broadly margined with rich chocolate brown, dusted with pale blue scales, and tinged inwardly with olive green. On the inner margin is a yellowish olive green cloud, dusky centrally, and slightly powdered with pale blue scales on the inner margin. Fringes dusky, palest at the base.

Secondaries clear pale ochre yellow, with a broad outer marginal band, rather narrower than that on the primaries, of rich chocolate-brown. This band dies out before reaching the apex, and incloses a narrow sub-marginal pale blue sinuate line. Inside this outer band and close to it, is an indistinct concolorous narrow line, most strongly marked on the inner margin. Fringes whitish tipped with chocolate.

Beneath, all the wings are clear pale yellow ochre. Fringes white, tipped very faintly with brown. There is a brownish black discal spot on the secondaries; and on the primaries the reniform spot is distinct and blackish, and there is a smaller, rounded, similarly colored spot on the discal area slightly nearer the base. The costa is also blackish at the base.

Expanse of Wings, 1.75 inches; *length of body*, 0.70 inch.

Habitat.—Massachusetts (Harris). Vermont (Putnam). New York (Fitch). Missouri (Riley).

Larva.—The following description is from Harris' correspondence, p. 306. "Entirely naked, pale sky blue; the head, a transverse band on each segment, except the last, which has two, anal valve and all the feet orange colored; head, bands and feet spotted with black, and on each segment six narrow, transverse lines, two of which are contiguous to the band on each side. When at rest this caterpillar elevates the third and fourth segments very much, and depresses the head. There

is an obtuse prominence or elevation of the anterior part of the eleventh segment, which is visible at all times." This larva feeds on the vine, devouring the entire leaf, and is found from May to September (Riley). It undergoes its transformations on the surface of the ground without making a cocoon, according to the last authority. For more detailed description of the larva of this species, as far as its structural peculiarities are concerned, the reader is referred to the quotations from Dr. Packard's writings under the genus *Eudryas* p. 145. It should be noted, however, that this writer describes the larva as hairy, while Dr. Harris says it is "entirely naked." Mr. Riley (loc. cit.) remarks that the hairs arising from the black spots are less conspicuous than in the larva of *Alypia octomaculata*. From this it would appear that the hairs must have escaped the notice of Dr. Harris, though it is difficult to understand how so close an observer was led into this error, for such I am inclined to believe it, though personally unacquainted with the larva. For the pupa, see p. 146.

Some of the larvæ which pupate early disclose the moth in the autumn, but others pass the winter as pupæ and do not appear on the wing until the following spring. (Riley.)

2.—EUDRYAS UNIO. (Pl. 7, fig. 2,)

Euthisanotia unio, Hübner.
Eudryas unio, Boisd., Spec. Gen. Lep. vol. 1. (1836.)
Eudryas unio, Harris, Ins. Inj. Veg. p. 310. (1841.)
Eudryas unio, Walker, Cat. Lep. B. M. vol. 9. (1856.)
Eudryas unio, Morris, Syn. Lep. N. Am. p. 246. (1862.)
Eudryas unio, Proc. Ent. Soc. Phil. p. 43. *Pupa*. (1864.)
Eudryas unio, Riley. 2nd Rep. St. Ent. Missouri, p. 83. (1870.)

♂. ♀.—Head and prothorax dark purplish brown, with many metallic scales. Palpi paler. Patagia white. Thorax white, with a broad median stripe concolorous with prothorax. Abdomen whitish above, yellowish beneath, with an indistinct row of lateral black spots.

Anterior wings white, with an outer broad marginal band, sinuated internally, and colored as follows in lines parallel with the outer margin. An outer sinuated whitish line, the outer indentations of which are filled with reddish brown. The inner margin of the band consists of a very narrow pale olive green line margined on both sides very narrowly with blackish brown; the centre of the band is whitish dusted

with reddish brown scales, which are thickest inwardly and at the anal angle. There is a reniform spot on the discal vein, dark chocolate near the costa, yellowish inside, and deeply excavate outwardly. A dark spot on the discal area, partly merged into the dark chocolate streak on the costa, which terminates at the reniform spot, and near which it is dusted with blue scales. There is also a dark brownish black spot on the inner margin, united to the outer band, projecting towards the disc of the wing, sharply truncated inwardly and continued along the inner margin but narrowing rapidly to the base. This spot is also thickly dusted with bluish scales.

Secondaries pale ochre yellow, with an outer reddish brown marginal band *extending to the costa*, and inclosing on the outer margin, a paler sinuate line. Inside this band on the inner margin is a dark parallel streak.

Beneath pale ochre yellow, with the discal spot on the secondaries, and the reniform and circular spots of the primaries distinct and blackish. The marginal band on all the wings is reproduced of a uniform pale reddish brown.

Expanse of Wings, 1.40 inches; *length of body*, 0.60 inch.

Habitat.—Atlantic States. Maine (Packard). New York (Fitch). Middle States. Missouri (Riley).

Larva.—The larva is said to be similar to that of *E. grata*, though I have been unable to find any detailed description of it. Dr. Fitch says in relation to it, having raised both the Eastern species from the grape, (3rd Report. Ins. N. Y., p. 399. 1856,) that it "is equally common with the preceding, and the worms are so much alike that we as yet know not whether there are any marks whereby they can be distinguished from each other." Another writer states (Proc. Ent. Soc. Phil., p. 43, 1864) that the pupæ of this species were found in winter in the stems of a species of reed (Hibiscus), as though the larvæ had been feeding in that location. These two modes of life are so different that one might almost be tempted to question the accuracy of one or the other of the observations; but presuming the latter fact to be correct, it furnishes additional evidence that *Eudryas* is correctly located among the Castiinæ, as against the position assigned to the genus by Dr. Harris among the Notodontidæ, which are exclusively external feeders.

The imago differs from *E. grata* in its smaller size; in the band of the primaries being pale and mottled instead of uniform dark brown; in the absence of the yellowish green tints of the upper wings, and

the dark color of the patch on the inner margin of the primaries. On the secondaries, the marginal band is continued to the costa, instead of dying out before the apex; and on the under surface the marginal bands reappear, which is not the case in *E. grata*.

3.—EUDRYAS BREVIPENNIS. N. S. (Pl. 7, figs. 3, 4.)

The figures of this species are only approximate. The type and only specimen known to me is badly rubbed, and somewhat mutilated, having lost its head, so that the exact nature of the latter and the details of the coloration of the marginal bands cannot be *accurately* figured or described, but it presents strong structural differences which clearly separate it from its Eastern congeners, and it was deemed best to insert it to call attention to the wide geographical range of the genus. It presents a combination of the characters of both *E. grata* and *E. unio*, though more similar to the latter, in having the same alar expanse, and in the presence of the marginal band on the wings beneath.

The insect is much broader in proportion to the expanse of the wings, the secondaries being much more rounded, than either of the species mentioned. When the wings are "set" so that the discal dot of the secondaries just touches the inner margin of the primaries, the proportions are as follows:

Alar expanse, - -	*grata* 1.75.	*unio* 1.40	*brevipennis* 1.40
Length of body, - -	" 0.70.	" 0.60	" 0.70
Breadth of wings, -	" 0.60.	" 0.52	" 0.58

It will thus be seen that with an alar expanse only equal to that of *E. unio*, the breadth of the wings from the costa of the primaries to the outer margin of the secondaries is nearly as great as that of *E. grata*, while the length of the body equals that of the latter species. This results from the following differences in the shape of the wings. The outer margin of the primaries is more strongly angulated, making the apex more rectangular, while the outer margin of the secondaries instead of being parallel with the costa is strongly rounded. In coloration the insect more nearly approaches *E. unio* than *E. grata*, though the abdomen is more like that of the latter species, being yellow with the dark, almost black tufts, extending to the tip, while there is a distinct lateral row of black spots. There is the same blackish spot connected with the marginal band on the primaries, and the marginal band reproduced on all the wings beneath, as in *E. unio*, but there is

a distinct, transverse, black discal spot on the secondaries above, and the black spots on the primaries beneath are much more conspicuous, almost blending into one, and the costa at the base is much more largely blackish.

Expanse of Wings, 1.40 inches; *length of body* 0.70 inch.

Habitat.—California. (Coll. Stretch.)

The specimen above referred to was taken in the California Theatre at San Francisco, having been attracted by the light, and was presented to the writer by H. Edwards, Esq., of that city.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus COSMOSOMA, Hubner.

"Wings mostly hyaline. The subcostal vein of the forewings is adjacent to the external margin, with two subcosto-marginal nervules, one from the disc arising at a point midway between the origin of the medio-posterior branch and its penultimate, the other exterior to the disc, midway between it and the origin of the post apical nervule. The apical branch beyond its middle sends off the post-apical nervule, and near its tip an apical nervulet to the costa. Median vein four-branched. Hind wings about half as long as the fore wings; without costal vein; subcostal bifid from the origin of the discal vein, which is very obliquely inclined towards the base of the wing and abruptly curved above the median, where it receives the discal fold. Median vein bifid exterior to the disc, with the lower branch furcate at the tip.

"Head moderate, smooth, neck not distinct; with ocelli. Face smooth and vertical. Eyes moderately prominent. Antennæ rather more than half as long as the body, pectinated to the tips in the ♂, less so in the ♀. Palpi rather stout, curved, exceeding the face, smooth, but hairy at the base; basal and middle joints nearly equal; terminal small and conical. Tongue equal to the thorax beneath.

"Body scarcely equal in length to the fore wings, rather slender, nearly linear. Patagia small. Legs moderately stout, smooth; fore tibiæ with a moderate, concealed spur from the base; hind tibiæ with four rather small spurs."

Clemens, Proc. Acad. Nat. Sci. Phil. p. 544. (1860.)

But one species of this genus is found in the United States, it being also reported to occur in Mexico. (Clemens.)

1.—COSMOSOMA OMPHALE. (Pl. 7, fig. 5.)

Cosmosoma omphale, Hübner.

Ægeria omphale, Say, Am. Ent. vol. 2, pl. 19. (1817–28.)

Glaucopis (C.) omphale, Harris, Sill. Journal, vol. 36, p. 317. (1839.)

Glaucopis (C.) omphale, Clemens, Proc. Acad. Nat. Sci. Phil. p. 544. (1860.)

Glaucopis (C.) omphale, Morris, Syn. Lep. N. Am. p. 135. (1860).

Glaucopis (C.) omphale, Clemens, Syn. Lep. N. Am. App. p. 266. (1862.)

Head bright metallic blue. Palpi black, basal joint scarlet. Antennæ black. Thoracic parts bright scarlet; prothoracic scales with a blue central dash. Patagia, at the base and outwardly dusky. Abdomen scarlet, with a central dorsal stripe and the three terminal segments black, but showing obsolete blue spots. Thorax beneath and legs scarlet; abdomen beneath black.

Wings hyaline, with the nervules black. On the primaries, the internal margin is narrowly black; the outer margin rather more widely of the same color; there is a black spot on the discal vein, and the apical third of the wing is of the same color. On the secondaries the apex and inner margin are black, and the costa less intensely so. Beneath, as above.

Expanse of wings, 1.50 inches. *Length of body*, 0.50 inch.

Habitat.—Florida (Clemens). Mexico (Clemens).

For my specimen of this beautiful insect I am indebted to the kindness of my friend, T. L. Mead, Esq., of New York, who however omitted to state the locality where the specimen was taken. If my memory serves me correctly, I believe he mentioned, in a previous conversation, that the specimens in his possession were taken in Florida.

3.—CISTHENE SUBJECTA. (Pl. 7, fig. 12.)*

Cisthene subjecta, Walk. Cat. Lep. B. M. vol. 2,, p. 534. (1854.)
Cisthene subjecta, Morris, Syn. Lep. N. Am. p. 254. (1862.)
Hypoprepia Packardii, Grote, Proc. Ent. Soc. Phil. vol. 2, p. 31. Pl. 2, fig. 5, ♀. (1863.)
Hypoprepia Packardii, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 98, (1864.)
Cisthene subjecta, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 103. (1864.)

♂. ♀.—Head black, rosy about the eyes. Palpi and antennæ black. Prothorax and patagia yellowish, thorax above blackish. Abdomen rose colored. Legs mostly whitish, partly brown.

Anterior wings steel gray, with a well defined yellowish spot on the costa near the apex. A longitudinal streak of the same color, on the internal margin, well defined, and commencing near the internal angle and continuing to the base of the wing, showing a spot of the same shade as the ground color.

Posterior wings rose color, with a wide greyish border not extending quite to the anal angle.

Var.—Costal spot of primaries obsolete, as is also the internal stripe except at its extreme tip.

Var.—Longitudinal stripe reduced to a narrow streak slightly dilated at its outer end.

Expanse of wings, 0.70 inch. *Length of body*, 0.25 inch.

Habitat.—Pennsylvania (Coll. Ent. Soc. Phil.) United States (Walker).

The above description is compiled from the writings of Messrs. Walker and Grote; the figure is copied from that given by Mr. Grote on Pl. 2 of the Proc. Ent. Soc. Phil. for 1863. Neither of these writers speak of the habits of the insect, though it is quite likely that from its minute size, it has escaped general observation. This species appears to bear the same relation to the following (*C. unifascia*) which the Californian, *C. nexa*, does to *C. faustinula.*

* See page 48, ante.

4.—CISTHENE UNIFASCIA. (Pl. 7. fig. 11.)

Cisthene unifascia, G. & R. Trans. Am. Ent. Soc. vol. 2, p. 187. Pl. 2, fig. 63 ♂. (1868–9.)

♂. ♀.—Head, prothorax and tegulæ, above, pale ochre yellow. Beneath, the legs are pale yellow; anterior and middle tibiæ masculate with lead color.

Primaries rather narrower than in C. subjecta, apices appearing more rounded, hind margin more oblique; lead gray, with a median pale ochre yellow band running from the costa to the internal margin, and continued along the latter to the base of the wing. This band varies in width, appears to be narrower in the ♂, and is constricted on the disc. It seems to be the result of the fusion of the spots on the costal and internal margins at this place in C. subjecta. Beneath, as above, the band showing a warmer tinge. Hind wings and abdomen rose color, former touched at apices with a leaden hue. (Grote, (loc. cit.)

Expanse of wings, 0.70 inch. *Length of body*, 0.25 inch.

Habitat.—Florida (Grote and Robinson). Texas (Belfrage).

Grote and Robinson say in relation to this species: "Notwithstanding the variability of our Northern *C. subjecta*, the present may be a distinct species. It merits a name in any event from the constancy of its ornamentation." The specimens from which the present figure was drawn were received from Mr. George Belfrage, of Texas, and vary from the above description only in the absence of any leaden hue on the tips of the secondaries. G. and R. in their Cat. Lep. N. Am. 1868, place the present species as a variety of *C. subjecta*, but from my knowledge of the two allied Californian species, I prefer for the present to consider *C. unifascia* as specifically distinct, more especially as the differences between *C. nexa* and *C. faustinula*, which we know to be distinct species, are much the same as those which separate *subjecta* and *unifascia*.

Since the above was written I have received a number of insects from Mr. Belfrage, and among them is a specimen of this species in which the transverse band is almost obliterated, though this and all the other specimens received show no leaden hue at the tip of the secondaries. Out of six specimens received from Mr. Belfrage this is the only one which shows any tendency to variation in the markings of the primaries, yet having noted this variation, it is quite possible that Messrs. Grote and Robinson are right in placing *C. unifascia* as a variety of

C. subjecta. It is far from safe to presume, that because we find in a *locality far distant* from that which we know to be the original home of a species, specimens differing slightly from the original type, that these specimens are specifically distinct; for among the insects referred to as received from Mr. Belfrage, are specimens of *E. mendica* and *Arctia arge* which cannot be separated from those found in New England. This question of geographical distribution has been a stumbling block with many Entomologists, and it may not be out of place to remark that many species have a much wider geographical range than has hitherto been awarded to them.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus ŒTA. Grote.

"The wings are longer than the body. The anterior rather narrow, enveloping the body when folded; apex obtusely rounded and hind margin slightly oblique. The subcostal nervule gives rise to a marginal nervule, about its middle, and within the disc forms a large secondary cell, from the hind end of which arise three distinct marginal nervules, the lower one reaching the costa rather above the tips. The disc extends rather beyond the apical third of the wing, and the discal vein gives rise to three nervules. The median is three-branched, the posterior branch being remote from the others, and arising opposite the origin of the subcostal branch, which forms the secondary cell. The fold is thickened and the submedian furcate at its base.

"The hind wings are rather broader than the fore wings; obliquely rounded along the hind margin from the tip to the base; costa nearly straight. The costal nervure distinct and simple; the subcostal simple and rather attenuated from the discal vein towards the base. The discal vein gives rise to two nervules, and sends a false nervule through the disc towards the base of the wing. The median subdivides into three equidistant nervules.

"Head rather small, smooth, free; without ocell. Face rather narrow, tapering, vertical. Eyes small, salient. Antennæ slender, with joints closely set, *serrated beneath with scales*. Palpi slender, cylindrical, curved, ascending rather above the middle of the front; basal joint squamose; middle and terminal joints smooth and equal in length. Tongue about one half as long as the body.

"Body slender, scarcely equal in length to the fore wings. Patagia scale-like. Abdomen slender, more than one half as long as the body beneath. Legs smooth and slender; fore tibiæ with a long concealed internal spur; hind tibiæ with a pair of apical spurs.

"The wing structure of the insect included in this genus resembles most strikingly that of the *Tineina*, and must form a group connecting the Glaucopidæ directly with it."

Clemens, Proc. Acad. Nat. Sci. Phil. (1860.)

This genus was described by Clemens under the name of *Pæciloptera*, for which Grote substituted *Œta*, the former being preoccupied. It contains but one American species in which the prevailing colors are black and yellow. The genus though referred above to the *Zygœninæ*, has many points of resemblance to the *Lithosiidæ*, and lies in the debateable ground between the two groups.

1.—ŒTA AUREA. (Pl. 7, fig. 10.)

Deiopeia aurea, Fitch, 3rd Rep. Ins. N. Y., p. 168. (1856.)
Pæciloptera compta, Clemens, Proc. Acad. Nat. Sci. Phil. (1860.)
Deiopeia aurea, Morris, Syn. Lep. N. Am. p. 251. (1862.)
Pæciloptera compta, Clemens, Syn. Lep. N. Am. App. 312. (1862.)
Deiopeia aurea, Packard, Proc. Ent. Soc. Phil. p. 106. (1864.)
Œta compta. Grote and Rob., List. Lep. N. A. Pt. 1. (1868.)
Cydosia aurea. Grote and Rob., List. Lep. N. Am. Pt. 1. (1868.)

♂. ♀.—Head yellow, with a black spot between the antennæ and a black band across the face. Palpi pale yellow, with the ends of the second and third joints black. Patagia and thorax reddish orange, the latter with two small black dots in front. Prothorax pale yellow blackish in front. Thorax beneath marked with pale yellow. Abdomen dusky brown, largely pale yellow beneath. Legs dusky with steel blue reflections. Coxæ of anterior pair orange, of the remainder pale yellow. Tibiæ of middle pair spotted with yellow; tibiæ of posterior pair with a long terminal brush in ♂.

Anterior wings reddish orange with four steel-blue-black transverse bands, containing clear yellow spots. The first at the base; the second inside the middle of the wing; the third exterior to the middle, wider than the others, constricted on the costa, and connected at the upper outward corner with the sub-terminal band, which runs from the costa to the anal angle and is constricted in the middle, thus leaving at the apex of the wing a square patch of its basal color. Fringes dusky.

Posterior wings slightly hyaline, smoky brown, darkest at the tip and along the outer margin. Veins blackish. Fringes dusky.

Beneath all the wings are smoky brown, the yellow spots of the primaries being very faintly visible as somewhat paler maculations.

Expanse of Wings, 1.00 inches; *length of body*, 0.45 inch.

Habitat.—Georgia (Fitch). Texas (Belfrage, Coll. Smith. Inst., Stretch). St. Louis (Grote).

Of the habits of this species Mr. Grote says Proc. Ent. Soc. Phil., vol. 4, p. 319), "*P. compta* clings to the stems of plants in dull weather, not willingly flying, and may be readily shaken off into the collecting bottle. The sexes do not differ. The wings are folded round the body when at rest." For my examples of this species I am indebted to Mr. Belfrage, of Waco, Texas. Mr. Grote notes its occurrence at St. Louis, Missouri, early in October, which appears to be later than the usual time of its evolution in Texas.

I have unfortunately not been able to examine the original description of Dr. Fitch's *Deiopeia aurea*, but as quoted by Morris (loc. cit.) I have no doubt that it refers to the same insect as *Pœciloptera compta*, of Clemens. Under these circumstances Dr. Fitch's name takes priority. It is somewhat surprising that the wonderful similarity of these descriptions has not been previously noticed, though the reason may probably be the reference of the insect to a genus with which it has no affinity except in color. Mr. Grote indeed suggests that Fitch's *D. aurea* may possibly be a species of *Cydosia*, and places it under that genus in the List of Lep. N. Am., Pt. 1, 1868, but makes no mention of its probable identity with any other described species. It is evidently a species of wide geographical range, and while Texas and the valley of the Mississippi may be looked upon as its home, its occurrence in Georgia is not surprising. Five specimens before me show no tendency to variation, though Mr. Grote states that the specimens collected in Missouri differ somewhat from Dr. Clemens' description, without specifying, however, in what particular.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus CYDOSIA. Westwood.

Head moderately large, free from the thorax; vertex flat; front very prominent, conical, projecting between the eyes which are prominent. Palpi short, stout, scaled, porrected, not reaching the front; tongue moderate. Antennæ of moderate length, simple, wide apart at the base, inserted immediately above the eyes. Thorax globose, smooth, finely scaled. Abdomen smooth, short, slightly projecting beyond the hind wings, moderately slender, truncated, tufted. Legs stout, middle pair with one pair, posterior pair with two pairs of spurs.

Anterior wings long and narrow. Costa straight, apex rounded, outer margin oblique, inner margin parallel with the costa. Median vein four-branched; 3rd remote from 1st and 2nd; 4th very remote from 3rd, rising near the base of the wing. Subcostal four-branched; 1st and 2nd thrown off near the end of discal area, rather short; 3rd furcate midway of its length, one branch reaching the costa, the other going to the outer margin; 4th rises on a short stalk, is long and nearly parallel with the costa.

Secondaries rather broader than the primaries; costa straight; apex produced, rounded; apical half of outer margin oblique; balance parallel with the costa; anal angle distinct.

This genus is subtropical, the species being of small size. Its colors are metallic, which circumstance assists in determining its true systematic position. It is loaded down with Lithosian affinities, and might even at first sight be mistaken for a Tinea. Two species are found in the southern portion of the United States, and others occur in Central America and the West Indies. I have in my collection an undetermined insect from Costa Rica, having the characteristic form and metallic green color of this genus, but with short pectinate antennæ, which connects Cydosia with the Zygænid forms having antennæ of that structure. The two American species may be distinguished thus:

Anterior wings wtth many white spots, - -	*C. nobilitella.*
Anterior wings without white spots, - - -	*C. aurivitta.*

1.—CYDOSIA NOBILITELLA. (Pl. 7, fig. 8.)

Tinea nobilitella, Cramer, Pap. Exot. Plate 264.
Cydosia nobilitella, Westwood.
Cydosia nobilitella, Duncan, Nat. Lib. Ins., vol. 5, p. 193. Pl. 24, fig. 2. (1858.)

♂. ♀.—Head, prothorax, thorax and abdomen dark metallic green, with the following white markings. A spot on the vertex, two smaller dots at the base of the antennæ, and a few white scales on the front and palpi. Two spots on the prothorax, two on each of the patagia, and five on the disc of the thorax. Thorax beneath, and legs dark metallic green, the latter largely spotted with white.

Primaries dark green, with metallic gloss; basal fourth of the costa, a transverse sub-basal band extending from the median vein to the internal margin and partially connected with the costal streak, a quadrate discal spot, and a subterminal somewhat sinuate transverse band, all dark metallic red-orange. Between these orange bands are a series of white spots arranged as follows. A small dot at the base of the wing; two others inside the basal band; one near the costa, between this band and the orange spot, and two between this spot and the subterminal band; two near the inner margin between the bands; and a terminal series outside the submarginal band, consisting of three principal quadrate spots, and several minor ones. The outer margin is very narrowly edged with white. Fringes blackish-green.

Secondaries dark metallic green immaculate, somewhat blacker than the primaries. Fringes dusky tipped at the apex with whitish.

Beneath, all the wings are blackish, the narrow white margin of the primaries, and traces of the white outer spots alone being visible.

Expanse of wings, 0.90 inches. *Length of body*, 0.35 inch.

Habitat.—Texas (Belfrage).

For my specimens of this beautiful little insect, I am indebted to Mr. George Belfrage, who took them in Western Texas, in May and June.

From certain remarks made by Messrs. Grote and Robinson, in their description of *C. aurivitta*, it is evident that they have received this insect from the same locality, and determined it as *C. nobilitella*. It is not without hesitation that I retain the specific name here given for the insect described and figured in the present number, and should not do so were it not for the reference of Grote and Robinson to it as

C. nobilitella, Cramer (loc. cit.) Not having Cramer's figure for comparison, I am compelled to accept the determination of Messrs. G. and R., while strongly believing that two or more species are mixed up under the same specific name. Dnncan (loc. cit.) states that Cramer's figure was drawn from an insect taken on the island of Curaçoa, and figures one taken on the island of St. Domingo. Both his figure and description show the posterior wings to be *white with a dark margin;* there is no mention of the terminal white line either in text or plate; and setting aside the number of the white spots which are much fewer in the insect described than in Duncan's figure, there still remains in addition the much larger size (1.25 inches) of the West Indian specimens to indicate the presence of two species. I have also beiore me a specimen from Costa Rica, which approaches the insect under consideration very closely. It expands 1.30 inches, and while the coloration is identical the white spots are fewer in number, more quadrate in form and the terminal white line is absent. It resembles the insect here described much more closely than do Duncan's description and figure, yet it is clearly a distinct form. I greatly regret the want of access to Cramer's work, a careful comparison with which can alone solve these discrepancies, but should this determination prove erroneous, I would suggest the name of *C. imitella* for the Texan species.

2.—CYDOSIA AURIVITTA. (Pl. 7, fig. 9.)

Cydosia aurivitta, G. and R., Trans. Am. Ent. S., vol. 2, p. 186. Pl. 3, fig. 68. (1868.)

"♂. ♀.—Entirely cyaneous black, lustrous, beneath less shining and more of a dead black. The male abdomen has the anal segment ringed with bright fulvous scales. Anterior wings with a golden yellow stripe on costa at base; a sub-basal stripe running transversely downward from median nervule to internal margin, sometimes resolved into two spots by its obsolescence on internal nervure. On the disc a subquadrate spot and a gently sinuate even transverse band before the margin. All these markings are very broad, evident and concolorous, being of a deep gold color. Elsewhere the insect is entirely immaculate, generally cyaneous, sometimes greenish black." (G. and R. loc. cit.)

Expanse of Wings, 0.90 inch; *length of body*, 0.35 inch.

Habitat.—Texas (Belfrage). Imago flies in May and June.

For my specimens of this insect I am indebted to Mr. George Belfrage, of Texas. In relation to it, Messrs. G. and R. say: "Though at first sight differing very greatly from its ally taken in the same locality, C. nobilitella, *Westwood*, it is in reality near it, wanting merely all the numerous dererminate white maculations on the body and wings which characterize its congeners." Mr. Belfrage states that it is generally distributed through Texas, though nowhere common, and that while usually taken on the wing in the daytime it is also frequently attracted by the lights at night.

BOMBYCIDÆ.

LITHOSIIDÆ.

Genus CRAMBIDIA. Packard.

"Head much as in Lithosia, but the front converges more anteriorly, and the scales are coarser and longer. Antennæ setose, otherwise simple, but a little stouter than in Lithosia and the porrect palpi are larger, extending a little farther out beyond the front.

"Body as in Lithosia. Primaries narrow oblong, one third as broad as long. Costa convex, apex subrectangular, outer edge very straight, one fourth as long as inner edge. Nervures remarkably equidistant. Costal midway between the marginal and subcostal nervure, 1st subcostal very short, arising remote from the second, and terminating on the costal, which last is very long. 2nd terminating on costa, opposite the fork of the 3d, which last encloses a long narrow apical interspace; 5th independent. *But two median nervules*, the nervure subdividing much within the middle of the wing.

"Secondaries broad triangular, reaching beyond the tip of the abdomen, of much the same form as in Lithosia, but two median nervules arising in the middle of the wing. Legs stouter than in Lithosia with much larger spurs. Abomen with a prominent tuft.

"Not only of smaller size than Lithosia, but differing in the straight outer edge of the primaries, and in the neuration, throughout; since Crambidia has one half shorter subcostal nervules, and the 5th is situated nearly in the middle of the wing; and I can discover but two median nervules, while Lithosia has three. Also in Lithosia, the median nervure subdivides on the inner third of the secondaries; in our genus at the middle of the wing. When at rest the wings are folded flat upon the abdomen, much as in Lithosia."

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 99.

1.—CRAMBIDIA PALLIDA. (Pl. 7, fig. 16.)

Crambidia Pallida, Packard, Proc. Ent. Soc. Phil., vol. 3, p. 99. (1864.)

Of a very uniform drab color, without any markings. Head and thorax tinged a little darker, while the nervules are very slightly paler. Secondaries very little paler than the front wings.

Expanse of Wings, 0.85–0.90 inch; *length of body*, 0.35 inch.

Habitat.— ♀. Mass. (Sanborn). ♀. Brunswick, Maine, August 6th. Packard, Proc. Ent. Soc. Phil., vol. 3, p. 99.

The type of this species, from which the above figure was drawn, was furnished by Mr. A. S. Packard, jun., to my friend H. Edwards, of San Francisco.

2.—CLEMENSIA UMBRATA. (Pl. 7, fig, 18.)*

Clemensia Umbrata, Packard, Ann. Rep. Peab. Acad. Sci., p. 85. (1872.)

♂.—"White, with a grayish tinge. Head white with a few scattered grey scales. Palpi whitish, lined with blackish inside, and tipped slightly with black. An irregular, interrupted, wavy, slightly curved line crosses the inner third of the wing, being most distinct on the subcostal and median vein. A broad dark band crosses the outer third of the wing, being broadest in the middle of the wing, where it is as wide as the wing itself on the basal third; its edges are very irregular; it encloses an inner and a much larger outer discal black dot. Edge of the wing with a marginal row of indistinct spots. Hind wings pale gray. Beneath pale gray, forewings a little darker than hind wings, the bands and spots obsolete.

Expanse of wings, 0.90 inch. *Length of body*, 0.25 inch.

Habitat.—California (H. Edwards).

Differs from the Eastern *C. albata* (see p. 51) in the broad shade crossing the forewings, while the general hue is duller, almost gray white; and the hind wings are grayish, while those of *albata* are white. Packard (loc. cit.)

The type of this species, taken near San Francisco, remains unfortunately as a mutilated specimen, having been broken in its travels. It is probably not rare, but has been overlooked on account of its small size.

* See p. 50 Ante.

BOMBYCIDÆ.

LITHOSIINÆ.

Genus EUSTIXIS. Hübner.

"Body slender, rather short. Palpi straight, slender, a little shorter than the head; third joint linear, conical at the tip, a little shorter than the second. Antennæ slender, setaceous very minutely pubescent. Abdomen extending as far as or a little beyond the hind wings. Legs slender; hind tibiæ with four long spurs. Wings long, narrow. Fore wings very slightly convex in front, conical at the tip, with a somewhat rounded angle behind; the three inferior veins approximate at the base. Hind wings with four inferior veins; third approximate at the base, fourth remote."

Morris, Syn. Lep. N. Am., p. 253.

This genus bears a strong resemblance to the *Tineina*, and might readily be mistaken at first sight for a member of that group. Two species are noted by Walker as found in the United States, though Grote and Robinson in their catalogue of the Bombycidæ suggest that they are probably identical. Having only one species before me, I am not prepared to say which theory is correct. Both insects have reddish secondaries and white primaries, the latter with numerous small dots of black or brown. They may be distinguished thus:

Spots on primaries black, - - - - *E. pupula.*
Spots on primaries reddish brown, - - - *E. subfervens.*

1.—EUSTIXIS SUBFERVENS. (Pl. 7, fig. 17.)

Mieza subfervens, Walker, Cat. Lep. B. M., 528.
Mioza subfervens, Morris, Syn. Lep. N. Am., p. 252. (1862.)
Mieza subfervens, Clem., Syn. Lep. N. Am. App., p. 306. (1862.)
Eustixis subfervens, G. & R., Cat. Lep. N. Am. (1868.)

Head, thorax and patagia white, the latter red at the base. Palpi salmon color. Thorax with a small central and two lateral red dots. Abdomen, legs and body beneath, salmon color.

Primaries white, with two oblique bands of dark brownish-red spots.

The first band at the basal fourth of the wing consists of three spots; the second band beyond the middle is somewhat curved and consists of four spots. The outer third and costal region of the wings are thickly dotted with reddish-brown scales.

Secondaries pale salmon color.

Beneath, all the wings are concolorous with the secondaries above.

Expanse of wings, 0.90 inch. *Length of body*, 0.25 inch.

Habitat.—United States (Walker). Western Texas (Belfrage).

For my type of this species I am indebted to Mr. George Belfrage, of Texas. Mr. Walker does not state in what part of the United States the original type was taken, though it is not unlikely that it came from Florida.

Genus **LITHOSIA.** Fabricius.

Head free, broad, finely scaled, smooth; front nearly square; vertex broad. Eyes prominent. Palpi short, porrect.

Thorax globose, smooth. Abdomen slender, not reaching the end of hind wings. Legs slender, smooth; hind pair with two pair of spurs.

Anterior wings very long and narrow; three times as long as broad. Costa nearly straight; apex rounded; outer margin slightly oblique; inner margin straight, nearly parallel with costa. Costal vein long. Subcostal five-branched, 1st thrown off near the base uniting with the costal; remaining branches thrown off in the following order, 5th, 2d, 3d, the latter being furcate; 4th springs at the origin of 3d, and with 5th goes to the outer margin. Median vein three-branched; 1st and 2d united at the base; 3d very long, distant from 2d, springing near the base of the wing.

Posterior wings long, nearly twice as broad as the primaries; outer margin oblique, rounded; costa straight. The wings folded round the body when at rest.

The three American species may be tabulated thus:

Wings slate colored, - - - - - -	*L. argillacea.*
Wings white.	
Head white, - - - - - -	*L. Casta.*
Head yellow, - - - - - -	*C. Cephalica.*

1.—LITHOSIA ARGILLACEA. (Pl. 7, fig. 13.)

Lithosia argillacea, Packard, Proc. Ent. Soc. Phil., vol. 3, p. 98. (1864.)

Lithosia bicolor, Grote, Proc. Ent. Soc. Phil., vol. 3, p. 74. (1864.)

♂.—♀. "Slate color and yellow. Lustrous slate color. Palpi yellow, with a few slate colored scales near the tips. Prothorax yellow, continued on to the costa of the primaries on the upper and under side of the wing, nearly to the apex. Costa of secondaries also tinged

with yellow. Coxæ of the three pairs of legs yellow, as is also the tip of the abdomen."

Packard, (loc. cit.)

Expanse of Wings, 1.10 inches; *length of body*, 0.32 inch.

Habitat.—New England States; Cutler, Me.; July. (A. S. Packard, jun.) Andover, Mass., (Garland). Athabasca River, July (R. Kennicott.

2.—LITHOSIA CEPHALICA. (Pl. 7, fig. 1.4)

Lithosia cephalica, Grote, Trans. Am. Ent. Soc., vol. 3, p. 176. (1870.)

♂.—♀. White. Primaries above, and secondaries above and beneath white, without markings. Primaries beneath, smoky. Head fulvous yellow. Body white above, smoky beneath. Legs smoky.

Expanse of Wings, 0.90 inch; *length of body*, 0.30 inch.

Habitat.—Texas.

This insect was forwarded to me, along with many other interesting forms, by Mr. Belfrage, of Waco, Texas. Grote (loc. cit.) states that it has the form of L. casta, *Sanborn*, (with which I am unacquainted,) "but is a smaller insect differing by the discolorous head."

3.—LITHOSIA CASTA. (Pl. 7, fig. 15.)

Lithosia casta, Sanborn.

Lithosia casta, Packard, Guide St. Ins., p. 385, fig. 24. (1869.)

"Pure milk white, with a slight slate colored tings on the hind wings, and is slate colored beneath especially on the hind wings. Just behind the middle of the abdomen are tufts of tawny hairs and the tip is white. (Packard loc. cit.)

Expanse of wings, 1.25 inches. *Length of body*, 0.40 inch.

Habitat.—Berlin Falls, New Hampshire, Aug. 19; Ausable Chasm, New York. (Sanborn.)

The figure is copied from that given by Dr. Packard. This species is much larger than *L. cephalica*, is much more slate colored beneath, and the head is white instead of yellow. It is still rare in collections.

7.—CALLIMORPHA CLYMENE. (Pl. 7, fig. 19.)*

Hypercompa clymene. Esper sp. "Schm. IV., 22, 10, pl. 182; Noct. 103, fig. 1. (1786.)
Haploa clymene, Hübner, Verz. p. 182. (1816.)
? *C. Colona*, "Hübner, Eur., fig. 135." H–Sch.
Callimorpha carolina, Harris Rep. Ins. Mass., p. 243. (1841.)
Hypercompa clymene, Walker, Cat. Lep. B. M. III., p. 650. (1855.)
Hypercompa clymene, Clemens, Proc. Acad. Nat. Sci. Phil., p. 536. (1860.)
Hypercompa clymene, Morris, Syn. Lep. N. Am. App., p. 345. (1860.)
Hypercompa clymene, Saund., Syn. Can. Arct., p. 28. (1863.)

♂.—♀. Head and prothorax ochre yellow, the latter with two black dots. Palpi ochre yellow, black at the tips. Patagia white, edged with brown in front. Thorax white, slightly yellowish behind, with a central broad brown stripe. Thorax beneath, and abdomen above and below clear ochre yellow. Legs the same; coxæ of anterior pair with a round black dot; outer edge of anterior and middle pairs dusky.

Anterior wings white; inner edge, costa and outer margin edged with dark brown, interrupted at the apex. A brown band crosses the wing from the anal angle to the costa, about two-fifths from the base; from the centre of this band, a second brown band runs to the outer margin just below the apex, dividing the wing into three principal white patches. The basal patch is triangular; that on the outer edge is frequently divided near the apex into three unequal spots by the brown nervules; and the one on the costa is more or less clearly divided into three sub-equal spots, by an expansion on the discal vein of the brown costal margin, and by toothed enlargements of the brown markings, between the discal vein and the apex.

Secondaries clear ochre yellow, with a brown spot near the outer margin and anal angle. Walker states that this spot is sometimes supplemented with one or two others.

* See p. 61 ante.

Beneath, all the wings are ochre yellow, the markings of the primaries being reproduced except those on the margins of the wing.

Expanse of wings, 2.00 inches; *Length of body*, 0.80 inch.

Habitat.—New York (Edwards, Grote). C[illegible] ders). Florida (Strecker, Chapman).

For my specimens of this species, I [illegible] H. Strecker, Esq., of Reading, Pa., who received them from Dr. A. W. Chapman, who collected them near Apalachicola, Florida. Mr. Strecker informs me that the six specimens received showed but slight tendency to variation. The only variation in the three specimens before me, is in the costo-apical spot, which in one instance, by the extension of the notches on the brown costal margin is *divided* into three unequal spots.

BOMBYCIDÆ.

ARCTIIDÆ.

Genus **ECPANTHERIA.** Hubner.

"Fore wings about one-third longer than the hind wings, with the subcostal vein having a single marginal branch from the cell, and another midway between the post-apical and inferior nervules; the latter arises a little exterior to the discal vein, and the former midway between the apical nervulet and the second marginal. The median vein is four-branched with the posterior moderately remote from the penultimate. Hind wings as long as the abdomen, with the interior sometimes dilated and rather caudate, neuration arctiiæform.

"Head small, depressed, smooth; without ocelli. Face moderate, retreating. Eyes rather small. Antennæ serrated in the ♂, simple in the ♀. Labial palpi short, not extending beyond the clypeus, rather stout and porrected; middle joint short, terminal joint very small. Tongue rather thick, slightly longer than the anterior coxæ.

"Body stout. Thorax globose, smooth with scales. Patagia erected, overlapping the front of the mesothorax, nearly square. Breast and abdomen smooth. Legs thick and smooth, the tibial spur of the fore legs moderate, hind tibiæ with two minute apical spurs."

Clemens, Proc. Acad. Nat. Sci. Phil., p. 523. (1860.)

This genus has but one representative in the United States, though it is numerously represented in the more tropical portions of America. It is unknown in Europe.

1.—ECPANTHERIA SCRIBONIA. (Pl. 7, fig. 20 ♂, 21 ♀)

Phalæna scribonia, Stoll, Supp., Cramer, Pap. Exot., p. 177, p. 41, fig. 3. (1787.)

Phalæna oculatissima, Smith, N. H. Lep. Ins. Georgia, p. 137. tab. 69. (1797.)

Bombix cunegunda, De Beauvois, Ins. Afriq. et Amer. (1805.)

Ecpantheria scribonia, Hübner, Verz., p. 183. (1816.)

Arctia scribonia, Ins. Inj. Veg., p. 241. (1841.)

Ecpantheria scribonia, Walker, Cat. Lep. B. M. III., p. 689. (1855.)
Arctia oculatissima, Duncan, Nat. Lib. Ins., vol. V., p. 169; pl. 20, fig. 4 ♀. (1858.)
Ecpantheria scribonia, Clemens, Proc. Acad. Nat. Sci. Phil., p, 523. (1860.)
Ecpantheria scribonia, Morris, Syn. Lep. N. Am. App., p. 346. (1862.)
Arctia scribonia, Harris, Ins. Inj. Veg.. p. 349. (1862.)
Ecpantheria scribonia, Saund., Syn. Can. Arct., p. 22. (1863.)
Ecpantheria scribonia, Saund., Proc. Ent. Soc. Phil., *larva*, p. 28. (1863.)
Ecpantheria scribonia, Riley, 4th Rep. St. Ent. Missouri, p. 141, fig, 63, *larva*, fig. 64 *a* ♀ b ♂. (1872.)

♂.—Head white, front blackish blue. Prothorax, thorax and patagia white. The prothorax has two large steel blue patches edged with black. The thorax has six similar smaller patches arranged in two rows. The patagia have a patch on the inner edge, constricted in the middle, the hindermost portion having a white centre. Abdomen blue black above with a narrow yellowish lateral line; whitish beneath with a ventral and lateral row of minute black spots. Thorax beneath white. Legs white; coxæ and inside of anterior pair steel blue. Tip of tibiæ and tarsi of remainder of the legs steel blue, except the tarsi of the hind pair which are partially white.

Wings white, thinly scaled, with many black spots showing metallic blue reflections, especially on the costa. The spots on the primaries are arranged as follows. A terminal, interspaceal series of lunate spots. Five large spots on the costa enclosing a narrow white line. The second of these from the base forms one of a transverse curved band of four spots, of which the two near the inner margin have white centres. Inside this band the wing is irregularly mottled with black. The third costal spot forms one of a similar band of seven spots, of which two lie at the end of the discal cell, and are black, while the rest have white centres; the one on the inner margin being partially fused with the similar spot of the first band. There is a single spot just outside the discal vein, and a series of four spots beginning at the base of the 3rd median and going to the fourth costal spot. There is also at the anal angle a large dark spot above and below the submedian vein, from which a double row of spots parallel with the outer margin goes towards the costa, the inner row extending only to the 1st

median vein, the outer one to the fifth costal spot. There is, besides, a pupilled spot on the inner margin near the anal angle, and one immediately above it inside the submedian vein. These spots form six more or less perfect transverse bands.

Secondaries white, slightly caudate, with a terminal series of small black spots on the outer margin, and a stripe of dusky hairs near the inner margin, with faint traces of a discal dot.

♀.—Much larger than ♂, and paler colored. Nearly all the spots on the primaries become black rings, with white centres; and the thoracic markings also have white centres, being reduced to black lines indicating the shape of the spots in ♂. The abdomen is dark ochre yellow above, with black spots at the sides, and a series of broad transverse dorsal blackish-steel-blue bands, each with a central notch in front. The abdomen is much stouter and the anal angle of the secondaries less caudate, while the discal dot is distinct. The costa of the primaries is also slightly more convex than in ♂.

Expanse of wings, ♂ 2.25 ♀ 3.25 inches; *length of body*, ♂ 0.85, ♀ 1.25 inches.

Habitat.—Atlantic States generally. Missouri (Riley). New York (Grote). Virginia (Lyman). North Carolina (Shute.) Canada West (Saunders). California? (Boisduval). Southern States (Riley.)

Larva.—The following description is from the pen of C. V. Riley, of St. Louis (loc. cit.) "Average length 2½ inches. Head black, polished, brownish at sides and below; epistoma, antennæ and palpi more or less distinctly glassy white, the joints of antennæ marked with light brown, cervical shield brown-black. Body above black, inclining to brown laterally; bright reddish-brown at sutures, showing in strong contrast, especially between joints 3—10 when the larva is curled up, but scarcely visible when straightened and contracted. Verrucose warts arranged as follows: On joint one, two each side of cervical shield; on jts. 2 and 3, a transverse row of 8; on jts. 4—11 inclusive 12, the 4 on dorsum trapezoidal, the two anterior ones approaching nearest; on jt. 12 a transverse row of six. Venter dull purplish-brown, the legs of the same color, the legless joints with four small verrucose warts. Hairs barbed, stiff, spine-like and jet black."

"This worm feeds, mostly during the night, upon the wild sun-flower (*Helianthus decapetalus*), the different species of plantain (*Plantago*), and and willows. My friend J. A. Lintner, of Albany, N. Y., thinks it likewise feeds on Black Locust, as he has often found it beneath that

tree and has fed it on the leaves. It comes to its growth in the fall, and curls up and passes the winter in any shelter that it can find, being especially fond of getting under the bark of old trees. In the spring it feeds for a few days upon almost any green thing that presents itself, and then forms a cocoon, casts its prickly skin, and becomes a chrysalis. The chrysalis is black, and covered with a beautiful pruinescence. It has a flattened blunt projection at the extremity, armed with a few barbs and bristles. In a few exceptional cases I have known this species to go through all the transformations and produce the moth in the fall. The chrysalis state lasts but a fortnight."

Boisduval states that this species is found in California, as I suppose on the authority of Mr. Lorquin. It has never been the good fortune of myself or fellow Entomologists to verify this observation, though the Wild Sun-Flower is abundant in many localities in the interior of the State, but seldom visited by Entomologists; and it is possible that the insect may have been taken during some of the rambles of Mr. Lorquin in these localities.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **HARRISINA.** Packard.

Wings extremely narrow. Hind wings ovate-lanceolate, narrower than the fore wings; length much less than that of the body; length of the fore wings somewhat more than that of the body. The disc of the forewings closed by a very faint, irregular vein, with *two disco-central nervules;* subcostal vein with a single marginal nervule from the posterior end of the disc and with the apical branch *trifid* near the tip of the wing or *bifid* with a long fork. Median vein four-branched, with the posterior scarcely remote from the penultimate. Fold of the wing thickened from the base to the tip. Submedian with a short fork at the base of the wing. Hind wings without costal nervure; subcostal bifid, with an oblique discal vein arising near the base of the lower branch, and angulated above the medio-superior nervule, where it receives the discal fold. Median vein four-branched, with nervules nearly equidistant.



Head rather small, free, smooth; with large ocelli. Face smooth, rounded, rather narrow. Eyes rather small, scarcely prominent. Antennæ with bases approached, much shorter than the body, rather deeply pectinated in the ♂, less pectinated in the ♀. Palpi very minute, filiform, drooping, with only two distinct joints; terminal joint acute. Tongue about as long as the thorax beneath.

Body extremely slender, cylindrical, not metallic. Patagia cylindrical, minute. Abdomen without lateral tubercle, tufted at the tip and along the sides. Legs extremely slender; fore tibiæ without tibial spur; hind tibiæ with two very minute apical spurs."

Clemens, Proc. Acad. Nat. Sci. Phil. 1860.

The characteristic colors of this genus are black, with bright colored prothorax. The three species found in the United States may be tabulated thus:

Apical vein bifid with long fork.

Prothorax orange. - - - - - - *H. americana.*

Apical vein trifid near the tip.

Prothorax black, - - - - - - - *H. coracina.*
Prothorax red-orange. - - - - - - *H. texana.*

"Under this name," says Dr. A. S. Packard, jun.,* "may be placed the *Procris Americana* of Dr. Harris, *Aglaope Coracina*, Clemens, and another undescribed form from the Middle States, communicated by Mr. F. G. Sanborn. Without attempting to improve upon Dr. Clemens' excellent description of this genus, we would merely point out some marked differences from *Procris*, Fabr., and *Aglaope*, Latr. From the latter genus Harris states that the *Americana* differs entirely. With Fuessly's figure of Latreille's *infausta* from Southern Europe before us, which has broad wings and bright colors, and differs throughout, we are convinced of Boisduval's mistake in referring our species to it."

"However it differs nearly as much from *Procris Vitis* and allies of Europe. The wings are a third longer and much narrower, the apex is much more rounded and the outer margin much more oblique. One of the best distinctions lies in the very ovate secondaries of *Americana*, owing to the convex outer edge, which in *Procris* and *Ino* as well as *Zygæna*, is angulated in the middle, thus giving the wing in those genera a squarish appearance. The nervules are longer and more parallel with the costa. When expanded the secondaries only reach to the basal third of the abdomen, while in *Procris* they reach to the basal two-thirds. The abdomen is remarkably square, a little flattened and slightly spreading in the female of *Harrisina*, in Procris it tapers gradually to an obtuse point."

In thus separating these insects under a new generic name Dr. Packard is undoubtedly right, but the new species (*H. Sanborni*) described in the same paper belongs to Dr. Clemens' genus *Acoloithus*, and according to Mess. Grote and Robinson=*A. falsarius*, Clemens. In their Catalogue of the Lep. N. Am. Messrs. Grote and Robinson place *Americana* and *Coracina* under the genus *Acoloithus*, Clemens, which can scarcely be right, as the two genera, as described by Dr. Clemens, differ very widely, not merely in the relative proportions of the wings and abdomen, but also in the neuration and structure of the antennæ.

From a careful comparison of insects referable both to *Acoloithus*, Clemens, and *Harrisina*, Packard, I am led to the conclusion that

* Proc. Essex Institute, April, 1864.

their separation generically is perfectly desirable, and that Dr. Clemens erred only in supposing that the insects he described were referable to *Aglaope* Latr., when in reality they were generically distinct and should have been separated under a new name. Thus *Harrisina* Packard= *Aglaope* Clemens, but not *Aglaope* Latreille.

1—HARRISINA AMERICANA. (Pl. 7, fig. 6. Pl. 10, fig. 8, larva.)

Aglaope americana, Boisd., Griff. Cuv. Reg. An. Lep. Pl. 84 bis. fig. 11. (1832.)
Procris dispar, Harris, Cat. Ins. Mass. (1833.)
Procris americana, Boisd., Sp. Gen. Lep. I. Pl. 16, fig. 7. (1836.)
Procris americana, Harris, Sill. Journal, vol. 36. (1839.)
Procris americana, Harris, Ins. Inj, Veg., p. 236. (1841.)
Ctenucha (*Aglaope*) *americana*, Walker, Cat. Lep. B. M. II., 286. (1854.)
Procris americana, Fitch, 3rd Rep. Ins. New York, p. 398. (1856.)
Aglaope americana, Clemens, Proc. Acad. Nat. Sci. Phil. (1860.)
Procris americana, Harris, Ins. Inj. Veg. 2nd Ed., p. 336, fig. 163. (1862.)
Procris americana, Morris, Syn. Lep. N. Am.. p. 134. (1862.)
Aglaope americana, Clemens, Syn. Lep. N. Am. App., p. 284. (1862.)
Harrisina americana, Packard, Proc. Essex Inst. (1864.)
Acoloithus americana, G, &. R. Cat. Lep. N. Am. (1868.)
Procris (*Acol.*) *americana*, Riley, 2d Rep. St. Ent. Missouri, p. 85, figs. 58, 59. (1870.)

♂.— ♀. Entire insect greenish black except the prothorax which is orange yellow.

Expanse of wings, 0.95 inch ; *length of body*, 0.40 inch.

Habitat.—Massachusetts (Harris). New York (Fitch). Missouri (Riley). Pennsylvania and Georgia (Clemens).

Larva (Riley, loc. cit.) "The full grown larva measures rather more than half an inch, and tapers a little towards each end. It is of a sulphur yellow color, with a transverse row of six velvety-black prickly tufts on each of the principal segments, the lower tufts being

less distinct than those on the back. The first segment is entirely black with a yellow edge, while the spots on segments 11 and 12 usually run into each other. Head small, brown, and retractile, being usually hidden in the first segment. Fine scattering hairs anteriorly, laterally and posteriorly. The young worm is of a very pale yellow, covered with numerous fine white hairs, with a slight grayish brown tint on the head, and with the fifth and seventh segments paler than the rest, and having the black spots scarcely visible." The larva is shown in Riley's figure 58 a, from which drawing I have reproduced it on Plate 10, fig. 8 of this work.

This insect may be distinguished from *A. falsarius* by its larger size, different shaped wings, and by its distinct neuration. From *H. texana* which also has a colored prothorax, and from *H. coracina* which is entirely black, it may readily be separated by the *bifid* instead of trifid apical vein.

The following account of its habits is condensed from the interesting paper of Mr. C. V. Riley (loc. cit.): The larvæ may be found in July and August feeding on the leaves of the Grape-vine. They are gregarious, and when young leave the minor veins of the leaf untouched, but devour everything except the main ribs in their later stages of growth. When full grown they disperse over the vines or forsake them entirely, and spin a small, tough, whitish, flattened cocoon, changing in about three days thereafter to chrysalis 0.30 inch long, broad flattened and of a light shiny yellowish-brown color. Some of these chrysalides produce the moth in a few weeks, but the majority are not evolved until the following spring, and thus the insect is apparently double brooded.

2—HARRISINA TEXANA. N. S. (Pl. 8, fig. 1.)

♂.—♀. Entire insect bluish black, except the prothorax which is reddish orange, almost scarlet. The insect greatly resembles *H. americana*, and might readily be mistaken for the latter, but while the *shape* of the wings is the same, the color is blue-black, instead of greenish-black, the prothorax is much *redder*, and the apical vein is *trifid* instead of bifid.

Expanse of wings, 0.80 inch; *length of body*, 0.38 inch.

Habitat.—Texas [Belfrage.] [Coll. Stretch.]

Collected on the wing May 5th and September 4th. From these dates it is presumable that its habits are similar to those of *H. ameri-*

cana. It is just possible that these insects may be identical with *H. coracina* Clemens, which that author states was taken in Texas, and the types of which are much rubbed; yet it is scarcely probable that all trace of the bright colored prothoraic scales would be obliterated, and Dr. Clemens describes *coracina* as entirely black. The neuration of the fore wings in *texana* corresponds with that of *coracina*, as given by Clemens, and though I have been unable to compare the insect above described with the types of *coraciua*, I am strongly inclined to the belief that they must be specifically distinct.

ZYGÆNIDÆ.

ZYGÆNINÆ.

Genus **ACOLOITHUS**. Clemens.

"The following insect greatly resembles *americana* in appearance and almost exactly in ornamentation. It must however be very distinct from it. The wings are extremely narrow. Hind wings broader than the fore wings, less ovate than in *americana*, and rounded at the interior basal angle; *length rather more than that of the body*. The disc of the wing is closed by a faint, irregularly oblique vein, *with one disco-central nervule*, and angulated at the medio-superior nervule, where it receives a rather faint discal fold. The subcostal vein with three equidistant, moderately erect marginal nervules *from the disc*, with the apical vein *simple*. Median vein four-branched, with the posterior nervule and the marginal opposite at their origins. The fold is thickened and the submedian vein simple. In the hind wings the subcostal vein shows a tendency to separate into two veins from its point of bifurcation towards the base of the wing and resembling two veins crossing each other, exterior to the point of bifurcation and a little behind the middle of the lower branch arises a decided, curved discal vein, which receives, just above the medio-superior nervule, a decided or thickened discal fold. The median vein is four-branched, with the two posterior branches equidistant from the second one.



"Head moderate, free, smooth; with large ocelli. Face broad, rounded. Eyes rather small, round and scarcely prominent. Antennæ nearly as long as the body, moderately pectinated in the ♂, minutely pectinated in the ♀. Palpi equal to the front, filiform, porrected, distinctly *three-jointed*, and with the joints nearly equal; terminal joint obtuse. Tongue-about half as long as the thorax beneath.

"Body short, rather slender, not metallic. Patagia very minute. Abdomen *as long as the thorax* beneath, not tufted at the tip and scarcely tufted along the sides, with a minute lateral tubercle on the basal segment. Legs extremely slender and rather short; fore tibiæ

with a slender tibial spur from the middle; hind tibiæ with two minute apical spurs."

Clemens, Proc. Acad. Nat. Sci. Phil. 1860.

This genus differs from *Harrisina* [q. v.] in the different form of the primaries, which are proportionally shorter, having a more convex costa and a different neuration; also in the form of the secondaries which nearly equal the primaries in length and are quite equal to them in breadth; in the length of the abdomen, which reaches about to the end of the hind wings; and also in the antennæ which have much shorter and coarser pectinations. The style of coloration is similar, being black with a bright colored prothorax, and is much nearer *Procris* of Europe than is *Harrisina*. The only known spectes is much smaller than any of its allies. Dr. A. S. Packard, jun., included it in his genus *Harrisina*, as we think erroneously.

1.—ACOLOITHUS FALSARIUS. (Pl. 7, fig. .)

Acoloithus falsarius, Clems., Proc. Acad. Nat. Sci. Phil., p. 540. [1860.]

Procris falsarius, Morris, Syn. Lep. N. Am., p. 134. [1862.]

Acoloithus falsarius, Clems., Syn. Lep. N. Am. App., p. 283. [1862.]

Harrisina Sanborni, Packard, Proc. Essex Inst. [1864.]

♂.—♀. Entire insect deep blue black, with the prothorax orange, hind wings rather thin.

Expanse of wings, 0.60 inch; *length of body*, 0 20 inch.

Habitat.—Texas [Belfrage]. Pennsylvania [Clemens]. Illinois [Kennicott]. Missouri [Riley].

The insect figured was received from Mr. Belfrage, of Texas. Though so closely allied in color to the various species of *Harrisina*, it may readily be separated by the generic characters.

EXPLANATION OF PLATE 7.

1.—Eudryas grata, - - - - Eastern States.
2.— " unio, - - - - - "
3.— " brevipennis, N. S. - - - California.
4.— " " underside. - - "
5.—Cosmosoma omphale, Hubner, - - - Florida.
6.—Harrisina Americana, Packard, - Eastern States.
7.—Acoloithus Americana, Clemens, East and South States.
8.—Cydosia nobilitella, Westwood, - - - Texas.
9.— " aurivitta, G. & R. - - - "
10.—Œta aurera, Stretch, - - - Southern States.
11.—Cisthene unifascia, G. & R. - - - Texas.
12.— " subjecta, Walker, - - Atlantic States.
13.—Lithosia argillacea, Packard, - - Northern States.
14.— " cephalica, G. & R. - - - Texas.
15.— " casta, Sanborn, - - - Atlantic States.
16.—Crambidia pallida, Packard, - - - "
17.—Eustixis subfervens, G. & R. - - - Texas.
18.——Clemensia umbrata, Packard. - - California.
19.—Callimorpha clymene, Packard, - - Florida.
20.—Ecpantheria scribonia, Hubner ♂. - Eastern States.
21.— " " " ♀. - - "


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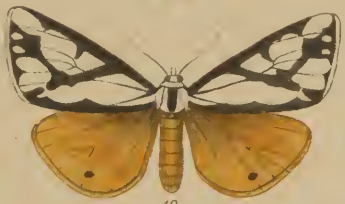

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ILLUSTRATIONS

OF THE

ZYGÆNIDÆ & BOMBYCIDÆ

OF

NORTH AMERICA,

BY

RICHARD H. STRETCH.

VOL. I.

PART 1 TO 9.

JULY 1872 TO DEC. 1873.

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BOMBYCIDÆ.

ARCTIINÆ.

Genus **EUCHÆTES.** Harris.

"Fore wings rather broad, trigonate. The subcostal vein gives rise to *two marginal nervules* from the posterior part of the disc, and between the second marginal nervule and the apical *is formed a short costal cell.* The post apical nervule arises midway between the costal cell and apical nervulet. The discal vein is angulated and the subcosto inferior are given off from a common point. The median vein is four-branched, the posterior nervule moderately remote from the penultimate. Hind wings as broad as the fore wings, with the neuration common to the family."

"Head moderate, depressed; with ocelli. Face inclined. Eyes small. Antennæ slightly pectinated in ♂, serrated in ♀. Labial palpi rather stout and ascending on the face nearly to base of the antennæ; basal and middle joints nearly equal; terminal short, three or four times less long than the middle joint. Tongue rather longer than the anterior coxæ."

"Body short or moderate. Thorax rather woolly; abdomen smooth. Legs with hairy femora; anterior tibiæ nearly as long as the anterior tarsi; internal spur concealed and half as long as the tibiæ; hind tibiæ with two pairs of spurs."

Clemens, Proc. Acad. Nat. Sci. Phil. p. 532 (1860).

The five species found in the United States may be tabulated thus:

Abdomen yellow.

Wings stone color.	*E. egle.*
Wings dirty white.	*E. oregonensis.*
Wings milk white.	*E. collaris.*

Abdomen rose color.

Wings pure white.	*E. elegans.*
Wings blueish cinereous, costa yellow.	*E. eglenensis.*

1.—EUCHÆTES EGLE. (Pl. 8, fig. 4 ♀.)

Bombyx egle, Drury, Ill. Nat. Hist. II., p. 36. pl. 20, fig. 3. (1773.)
Spilosoma egle, Westwood, Ed. Drury (1837.)

Euchætes egle, Harris, Ins. Inj. Veg., p. 257. (1841.)
Spilosoma egle, Walker, Cat. Lep. B. M. III. p. 669. (1855.)
Euchætes egle, Clemens, Proc. Acad. Nat. Sci. Phil., p. 532. (1860.)
Spilosoma egle, Morris, Syn. Lep. N. Am. p. 343. (1862.)
Euchætes egle, Harris, 3d Ed. Ins. Inj. Veg. fig. 172 *larva*, 173 *cocoon*, 174 *pupa*. (1862.)
Euchætes egle, Packard, Proc. Ent. Soc. Phil., p. 130. (1864.)
Euchætes egle Harris' Corr., p. 288, pl. 2, fig. 5, (larva.) (1869.)

♂. ♀.—Entire insect both above and below soft blueish-gray or stone color. Fringes paler.

Abdomen dirty yellow ochre above, paler beneath; with a dorsal and double lateral row of small black spots.

Expanse of wings 1.75 inches; *length of body*, 0.60 inch.

Habitat.—Atlantic States generally. Canada [Saunders].

Larva.—"Feeds on milkweed (*asclepias syriaca*); is gregarious, feeding in parallel lines or files on the under side of the leaves, eating the leaves from the edges. August 20th."

"Head and body black, with a narrow, white, lateral line and sixteen legs. Head incurved, and first four segments arched upward, in repose. Each segment with a transverse series of short, stellated tufts of whitish hairs; second and third segments each with four black pencils curving over the head, and nearly horizontal in repose; fourth segment with a short, dorsal tuft of black hairs, covered on each side by an erect, conniving pencil of black hairs before, and a shorter, incurved, white tuft behind; a horizontal white pencil on each side above the white lateral line; fifth to ninth segments, inclusive, each with a dorsal black tuft, covered at the sides before by a dark orange, and behind by a lighter orange, or pale yellow, incurved, longer tuft; on each side above the white lateral line a horizontal black pencil; tenth segment with a central black tuft, covered before by a deep orange, incurved tuft, and behind by a snow white one, also incurved or connivent, and on each side, instead of the black horizontal pencil, a longer white pencil. Eleventh segment with a dorsal black tuft covered, as on the fourth, with two erect, connivent (but not incurved), black pencils before, and shorter white, incurved ones behind; lateral pencil black. Twelfth or anal segment with a dorsal jet black tuft, covered on each side by a longer, incurved, black pencil; no lateral pencil.

"The short lateral tufts are jet black. The pencils are of a black color, not nearly so intense." (Harris Corr. p. 288. 1869.)

The typical form of this species is readily distinguished from all its congeners by its dark color; while the albino form spoken of by eastern Entomologists, but which I have never seen, may be distinguished from *E. collaris*, with which, as I have stated under that species, it has probably been confounded, by the different structure of the two insects, as well as by the coloration of the body parts. This albino approaches much more nearly to *E. oregonensis*, though the latter is probably distinct. The knowledge of its preparatory states can, however, alone definitely decide the question. Dr. Packard states that Mr. Shurtleff raised an insect which corresponded well with Dr. Fitch's *H. collaris* from a brood of *E. egle*, but if the insect subsequently described in these pages as *E. collaris*, and of this I have little doubt, as Dr. Fitch's description is exactly filled, the limit of the term "species" will have to be greatly extended, as the two insects are *structuralty* different, and present a greater variation than do *alypia octomaculata* and *Langtonii*, *Arctia virgo* and *Saundersii*, and other insects whose specific difference has been accepted.

2.—EUCHÆTES OREGONENSIS. N. S. (Pl. 8, fig. 7 ♂.)

♂.—Head bright yellow ochre, clypeus white. Eyes black. Palpi dusky at tips, yellowish at the base. Antennæ white, pectinations black. Prothorax dusky white, yellowish at the sides. Thorax and patagia dusky white, paler than prothorax. Abdomen slender, *bright yellow ochre* above, terminal segment and beneath whitish. A dorsal series of small velvety black spots, and a lateral row of similar spots of much reduced size. Legs whitish, dusky above; tibiæ and tarsi of anterior pair blackish; coxæ of the same pair dusky, margined with yellow.

Wings above dirty white; anterior pair somewhat the darkest, with paler veins. Fringes silky white.

Beneath as above, except that the interspaces of the primaries are inclined to smoky, especially near the costa. ♀. unknown.

Expanse of wings, 1.60 inch; *length of body*, 0.60 inch.

Habitat.—Oregon. (Coll. Stretch.)

For the type of this species, I am indebted to the kindness of Lord Walsingham, who captured the single specimen above referred to, in Oregon, during his recent trip to the Pacific Coast. In form it approaches nearest to *E. egle*, from which it differs not merely in the color of the wings, but also by the slenderer abdomen, and the bright

yellow head. Were it not for these latter differences, it might be considered an albino of *E. egle*, though the typical form of that species is yet unknown from the Pacific Coast.

3.—EUCHÆTES COLLARIS. (Pl. 8, fig. 5, ♂.)

Hyphantria collaris, Fitch, 3d Rept. Ins. N. York, p. 265. (1856.)
Tanada antica, Walker, Cat. Lep. B. M.
Spilosoma collaris, Morris, Syn. Lep. N. Am., p. 314. (1860.)
Arctia sciurus, Boisduval, Ann. Soc. Ent. Belg., vol. 12, p. 79. (1868.)

♂.—White. Head pale yellow ochre. Eyes black. Palpi pale ochre beneath; above and at the tips, black. Antennæ white, pectinations black. Prothorax and patagia yellow ochre, the latter whitish behind. Thorax white. Abdomen slender, whitish, with the *outer half* of each segment above yellowish. A dorsal series of black, segmentary spots, and a double lateral series of similar spots, the lower row being the smallest. Legs white above, dusky beneath; coxæ of the anterior pair, yellow ochre.

Wings pure milk white. Basal half of the costa of the primaries yellow ochre, most intense near the base of the wing.

Beneath, as above; except that the discal area of the primaries is smoky; while all the primaries, and the costa of the secondaries have a yellowish tinge.

♀.—Similar to ♂, but somewhat smaller, and wanting the yellow color at the base of the primaries.

Expanse of wings.— ♂. 1.60–1.80 ♀ 1.40–1.70 inches; *length of body*, 0.60, 0.65 inch.

Habitat.—Mississippi (Fitch). Pennsylvania, (Strecker). Canada (Saunders). California (H. Edwards).

The specimen from which the accompanying figure was drawn, was taken by my friend H. Edwards, Esq., near Yosemite Valley, California. The insect was not uncommon in that locality, but apparently local. Specimens differing in nothing but somewhat inferior size, were forwarded from Pennsylvania by H. Strecker, Esq., (in response to a request for the white variety of *E. egle*,) with the remark that it was not uncommon in certain places, but that he had never seen typical specimens of *E. egle* in that neighborhood. *E. egle* (type) is yet unknown in California. From these circumstances and a comparison of the insects, I am satisfied that the *H. collaris* of Fitch has been confounded

with an albino from *E. egle,* and that the insect now under consideration is specifically distinct, exhibiting not merely colorational but also structural differences, although Dr. Packard states, (Proc. Ent. Soc. Phil., p. 130, 1864), that "from the same brood of larvæ, Mr. Shurtleff has raised both the typical forms, (of *E. egle*), and a white variety which agrees well with Dr. Fitch's description of *Hyphantria collaris.*"

Six specimens of *E. collaris,* three from California and three from Pennsylvania, show the following points of difference as compared with three specimens of *E. egle* : The costa is more convex, and the width of the primaries, as compared with their length, is greater ; the posterior wings are more ample ; the body is much slenderer, especially in the ♀, which also wants the woolly tuft so conspicuous in *E. egle.* These differences, which fully warrant Boisduval's "statura gracilior," would indicate its specific difference independently of the marked dissimilarity in color. I am therefore forced to the conclusion that writers who were unacquainted with this form, have sought, and suspected that they had found the *Hyphantria collaris* of Dr. Fitch, in albino forms of *E. egle.*

Its early stages are, unfortunately, unknown, though Mr. Strecker writes me that the milkweed (*asclepias*) is common where the specimens which he sent were taken. The history of this species now becomes an interesting question, and one which will, I trust, engage the attention of persons living where *collaris* and its congener *egle* are abundant. With our present knowledge of the imago only, it requires a very broad interpretation of the term "species" to include them under the same specific name.

4.—EUCHÆTES ELEGANS. N. S. (Plate 8, fig. 6, ♂.)

♂.—White. Head and palpi white, the latter rosy at the base, and the former very narrowly rosy behind, particularly near the eyes. Antennæ white, pectinations black. Prothorax patagia, and thorax white. Abdomen *rosy* above, dusky white beneath, with a faint dorsal row of whitish spots, centered with dusky, and a lateral row of black spots. Legs whitish, with the coxæ of the anterior pair pale rosy.

Wings pure glossy white, immaculate.

♀.—Similar to ♂, except that the colors of the abdomen are less distinct, and the last segment of the abdomen is tufted with dense whitish hairs, somewhat as in *E. egle* ♀.

Expanse of wings, ♂. ♀ 1.45 inches; *length of body* 0.55 inch.

Habitat.—Owen's Valley, California, (Coll. Stretch.)

Described from 1 ♂ ♀ in good preservation. In the form of the wings and general structure of the body, this species closely resembles *E. egle* and *oregonensis*, but the wings are narrower than in *E. collaris*. The color of the abdomen separates it readily from its allies found in the United States, though there is a very similar Mexican species with a rosy head. Habits unknown.

BOMBYCIDÆ.

ARCTIINÆ.

Genus ANTARCTIA. Hübner.

"♂.—Head very prominent, owing to the long frontal hairs, which form a conical horizontal tuft. Antennæ with long even pectinations. Palpi porrect, long and slender; the tips acute, projecting beyond the front. Thorax very pilose, remarkably stout, while the abdomen is short conical, rapidly tapering to the subacute tip. The scales of the prothorax are hardly distinguishable from those of the rest of the thorax."

"Primaries a little more than one-half as broad as long, being short, broad and oblong. Costa straight, apex obtusely rectangular. Outer margin straight, suddenly bending around near the inner angle. Costal nervure long, terminating near the 1st and 2nd subcostals. Origin of 4th very remote from 5th, arising near the outer margin. First three median nervules arise much beyond the middle of the wing; the 3rd being close to the 1st and 2nd."

"Secondaries reach farther towards the tip of the abdomen than usual. Costa long, and straight; apex rounded, a little produced; outer edge long, convex, not bent in the middle. The three median nervules arise very near together, slightly angulated at their origins."

"Legs somewhat slender, long, pilose. Body beneath very pilose."

"Coloration uniform tawny, with no markings except discal dots and transverse bands of black dots."

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 122.

♀.—Very different structurally from the ♂; antennæ very minutely pectinated, almost simple. Thorax above and below nearly smooth, abdomen finely scaled. Anterior wings, with costa more convex than in ♂, and the outer margin more oblique, making the tip more acute.

Of this genus Dr. Packard says: "In form this genus closely resembles Lederer's genus *Ocnogyna* in the much produced prominent head, owing to the length of the frontal hairs; in the deeply pectinated large stout antennæ; the short broad wings and very short wooly body and short abdomen. The costa of the primaries is remarkably straight; the outer edge straight, making the apex rectangular, but they differ

from the above mentioned genus. The peculiar coloration is abnormal in this family. It was this, besides the short woolly body and short broadly pectinated antennæ, that most probably led Hübner to place it near *Clisiocampa* in his 'Verzeichniss.'"

Dr. Packard was apparently unacquainted with the ♀, which differs so strikingly from the ♂ that it might readily be mistaken for another genus. In appearance it resembles *Phragmatobia*, the body being nearly smooth, and the wings inclined to transparency. The ♂ differs widely from *Phragmatobia*.

The only American representavies of the genus are found in California, and are remarkable for the extreme variability of their coloring, scarcely two specimens, especially of the males, being exactly alike. In this respect the genus resembles its close ally *Leptarctia*, and the determination of the species becomes a task of great difficulty and uncertainty.

1.—ANTARCTIA VAGANS. (Pl. 8, fig. 8, 9, 10, ♂ 11, 12, ♀.)

Arctia vagans, Boisduval, Ann. Soc. Ent. Fr. (1852.)
Nemeophila rufula, Boisduval, Ann. Soc. Ent. de France, p. 32. (1855.)
Antarctia punctata, Packard, Proc. Ent. Soc. Phil., vol. 3, p. 123. (1860.)
Arctia vagans, Boisd., Ann. Soc. Ent. Belg., vol. 12, p. 28. (1868–9.)
Arctia vagans, Boisd., " " " " " p. 79. (1868–9.)
Arctia rufula, Boisd., " " " " " p. 79. (1868–9.)
Nemeophila rufula, G. & R. Cat. Lep. N. Am. Pt. 1. (1868.)
Phragmatobia vagans; G. & R. Cat. Lep. N. Am. Pt. 1. (1868.)

♂.—Head, thorax and abdomen above and below very hairy, concolorous with anterior wings, the abdomen rather palest. Palpi and breast round the head blackish. Antennæ, stalk concolorous with primaries, pectinations black. Legs concolorous with thorax. Femora of anterior pair pinkish inwardly. Tibiæ blackish inside.

Anterior wings pale drab, stone color, fawn color, mouse color or blackish, and all intermediate shades, with concolorous fringes, and marked as follows with dark blackish brown. A small dot on the discal vein and one at the base of 2nd median nervule. A narrow outer band, interrupted below 4th median, consisting of spots partially coalescing, commencing a little outside the middle of the inner margin, running obliquely towards the apex; at the 2nd median it curves

rapidly toward the costa, on approaching which it is deflected sharply towards the base of the wing. Inside the discal dot is a second band, less prominent than the first, consisting of cloudy spots, originating near the outer band on the inner margin, going direct to the median vein between the 3rd and 4th nervules, where it bends inward towards the costa. There is likewise an indistinct basal band consisting of four or five cloudy spots, most conspicuous near the costa. It is only in exceptional cases that all these markings are present. The basal band is most subject to obliteration, then the median band, and least frequently the outer band, while the discal dot is almost always distinct, but the wings are sometimes immaculate.

Secondaries smoky black, with the fringes and a very narrow outer margin concolorous with primaries. Discal dot deep black. From this type the wings vary to a tint uniform with the primaries, the discal dot being, however, almost always present. The least persistent black shades are the interspaces of the median nervules. The last to disappear are the interspaces between the principal veins at the base of the wing and an irregular submarginal band. The loss of color on the secondaries appears to have no connection with the obsolescence of the spots on the primaries, as insects with all the markings present on the primaries sometimes have pale secondaries, and vice versa.

Beneath, the primaries are concolorous with upper surface, the two discal dots blending into one larger and more conspicuous spot, with traces on the costa of the two principal bands. Secondaries either black as described in the type or concolorous with primaries above, and the discal spot conspicuous. There does not appear to be the same gradual obsolescence of the black beneath as above, the secondaries being either all black or all pale, though no rule seems to govern the color, as specimens black above are sometimes pale and sometimes black beneath, but specimens pale above are never black beneath.

♀.—Smaller than ♂, more finely scaled, thorax smooth, abdomen very finely scaled. Head, thorax, abdomen, palpi and legs concolorous with primaries, the thorax beneath being usually a shade paler than above.

Primaries varying from a clear brick red to reddish brown, never pale stone color, usually darkest along the costa. The discal dot is usually present, or indicated by a darker shade, and there are sometimes, but not often, traces of the outer band.

Secondaries smoky black, with fringes and narrow outer margin concolorous with primaries; never pale.

Beneath, concolorous with primaries, secondaries never black ; the discal dot is present on all the wings, and there are occasionally traces on the secondaries of a black marginal band.

The ♀ varies chiefly in the tint of the ground color, and not in the ornamentation, which is more constant than in ♂.

Expanse of wings, ♀ ♂ 1.30 to 1.50 inches ; *length of body*, 0.60 to 0.65 inch.

Habitat.—California generally.

Larva.—♂. Length about 1.25 inches. Head reddish brown ; front black ; suture between the lobes pale ; oral appendages reddish brown. Legs reddish brown, abdominal legs flesh colored, dusky at the base and hairy outwardly. Body deep velvety black above, paler beneath, with very faint traces of a yellow lateral stripe. Stigmata white, very small. Body covered with tubercles, those on the dorsum black, those on the sides whitish centrally. The black dorsal tubercles carry tufts of uneven, stiff, radiating, deep glossy black hairs, mixed with rusty hairs on segments 1, 2 and 3. The lateral tubercles carry similar hairs of a pale dirty color somewhat inclined to rusty, but not showing the decided red tinge of those on the back. The terminal segments have the hairs somewhat longer, and on segments 1 and 3 there are a few very long pale scattered silky hairs.

♀.—Differs from the ♂ in having the sides of the body more decidedly speckled with yellow, the lateral tubercles more distinctly pale, and all the black tufts of hairs on the back are mixed with hairs concolorous with those on the sides, giving the larva a paler and dirtier appearance.

This larva bears a strong resemblance to the young larva of *L. acræa*. It feeds on the various species of Lupin (so abundant in California) and thistles indiscriminately ; is full fed about the middle of August, when it spins a thin cocoon among the dead leaves on the ground, working up into the cocoon the grains of sand or fragments of leaves adjacent to it. The insect is single brooded, appearing on the wing in April and May, and comes freely to light.

I do not remember to have seen any notice of a discrepancy in the larval coloration of the two sexes, but it is quite marked in the species under consideration. From whatever cause, the variation in the colors of many Californian insects is very remarkable, and fully as great in *Antarctia* as in *Leptarctia*. While discussing this question my friend H. Edwards suggested the propriety of separating these two varieties of the larva, to see if the result would throw any light on Boisduval's two

species, *vagans* and *rufula*, which we had been unable to satisfactorily identify. The experiment was tried, with the unexpected result that one box produced all males conforming to Packard's genus *Antarctia*, and the other box all females much more strikingly like *Phragmatobia*, but which former experience told us were only the two sexes of the same species.

After raising a long suite of these insects from the larva, I am forced to the conclusion that Boisduval's *vagans* and *rufula* and Packard's *punctata* are all the same insect in some of its different varieties, though Boisduval says of *vagans*, "size of very small specimens of *fuliginosa*" Boisduval relies upon a *blackish line outside the central dot*, to separate *rufula* from *vagans* and says of *vagans* "always pale beneath," but I have raised from the same lot of larvæ, collected on the same bush, specimens in which the blackish line is present and others in which it is wanting, and have before me, while writing, upwards of sixty specimens with every conceivable intergradation. I am, however, strongly of the opinion that there is yet an unseparated species, in which the hind wings are *never dusky* and which may possibly be the *A. punctata* of Packard as described in the first paragraph, though the specimens alluded to as received from Mr. Edwards, and having dusky secondaries, are undoubtedly *A. vagans* Boisduval. In a genus so liable to variation it is not safe to erect a new species on two or three specimens, especially where they offer many characters common to one already described, but my friend, H. Edwards, possesses several specimens from the high Sierras, which I suspect are specifically distinct. They are smaller in size, the secondaries are concolorous with primaries, and the markings more constant; but while the general appearance is different, it is very difficult to define in intelligible words, what strikes the eye at once in looking at them.

BOMBYCIDÆ.

COCHLIDIINÆ.

Genus **LITHACODES.** Packard.

"Body slenderer than usual. Head large, vertex nearly continuous with the thorax. Front long quadrate. Antennæ long simple, filiform. Palpi very long, curved upwards in front of the clypeus, reaching above the vertex, the third joint long, acute. Fore wings long and narrow, more regularly oblong than in any of the other genera; costa hardly convex, outer margin nearly straight, suddenly rounded at the internal angle; inner edge very full at the base. 1st and 2nd subcostals short; upper branch of the 3rd subcostal long, so that the apical interspace is much longer and narrower than in *Limacodes*. Apex of the secondaries rounded, outer margin full and rounded. Spines of the hind tibiæ large and stout. Genital armor much longer than in *Limacodes*. This genus reminds us strongly of Hübner's genus *Lithacodia*."

Packard, Proc. Ent. Soc. Phil., vol. 3, p. 345. (1864.)

The species of this genus are small brown moths, and have a wide geographical range in America. The two species found in the United States may be separated thus:

Anterior wings with *one* transverse fascia, - - *L. fasciola.*
Anterior wings with *two* transverse fasciæ, - - *L. rectilinea.*

LITHACODES RECTILINEA. (Pl. 8, fig. 13, ♀.)

Limacodes (*lithacodes*) *rectilinea*, G. & R., Trans. Am. Ent. Soc. vol. 2, p. 188, pl. 2, fig. 61 ♂*. (1868.)

♂. ♀.—"Ocherous. Basal half of the primaries evenly and entirely ocherous brown. A median, nearly straight and even transverse dark wood-brown line, edged within by a whitish shade. This is the prominent inner margin of the usual inverse Y-shaped mark. A corresponding line runs from the costa before the apex outwardly, joining the external margin a little below the middle. The ocherous

*G. & R.'s figure is incorrectly quoted on p. 188, (loc. cit.) as fig. 62.

ground color of the wings appears beyond this line over the apex, and forms an inconspicuous spot at the internal angle. The space included between the lines is paler than the rest of the wing, appearing as if washed with whitish, which latter shade seems to be spread outwardly from the median line. Secondaries very dark wood brown, immaculate. Fringes ocherous. Beneath ocherous brown, a little clearer colored along the costa. Head, thorax and appendages ocherous brown; abdomen a little darker.

Var. *a.*—A specimen has the lines of the primaries above obsolete; the white shading is prominently expressed and leaves as usual the apex and a smaller space at the internal angle free." (G. & R. loc. cit.)

Expanse of wings, 0.90 inch; *length of body*, 0.35 inch.

Habitat.—South Carolina (Zimmerman, coll. Mus. Berol.) Texas (Belfrage, coll. Stretch, Edwards.)

The specimens above referred to from Texas, agree with the description quoted, except in the pale color of the secondaries, which can scarcely be called *dark*, being somewhat paler than the basal half of the primaries, and the nearly complete obsolescence of the spot at the anal angle of the anterior wings. These differences are not sufficient to warrant their separation specifically.

"Longer than L. *fasciola*, H.-S., and at once distinguishable by the paler color and straighter median line of the fore wings above. The palpi are prominent, as in *L. fasciola*, and the wings similarly shaped. *L. rectilinea* appears to us intermediate between *L. biguttata*, Packard, or rather *L. y-inversa*, Packard, and *L. fasciola*, and to evidence the position of the latter as belonging to this genus." G. & R. loc. cit.

The specimens received from Mr. Belfrage were taken in May, and according to that gentleman the insect is frequently attracted by lights, in company with the other small *Cochlidiinæ* found in the same neighbourhood.

2.—LITHACODES FASCIOLA. (Pl. 8, fig. 14, ♂.)

Limacodes fasciola, H.-S., Lep. Exot. sp. Ser. I., fig. 186. (1854.)
Limacodes fasciola, Walker, Cat. Lep. B. M. V., p. 1148. (1855.)
Limacodes laticlavia, Clemens, Proc. Acad. Nat. Sci. Phil., p. 157. (1860.)
Limacodes (?) *fasciola*, Morris, Syn. Lep. N. Am., p. 127. (1862.)
Limacodes laticlavia, Morris, Syn. Lep. N. Am. p. 128. (1862.)

Lithacodes fasciola, Packard, Proc. Ent. Soc. Phil., vol. 3, p. 346. (1864.)

Lithacodes fasciola, Packard, Guide. Stu. Ins., p. 290, fig. 221.

♂. ♀.—"Head, thorax and abdomen reddish ocherous. Anterior wings dark ocherous yellow to reddish brown, with an oblique silvery band, inclined towards the base of the wings, from the costa to the middle of the inner margin, and toothed toward the base on the submedian nervure or fold. A rather faint reddish-brown line extends from the costal origin of the silvery band to the hind margin beneath the middle. Hind wings pale ocherous yellow."

"*Var.* (♀). Imago brownish luteous, sometimes inclining to yellowish. Fore wings with an oblique silvery band from the costa to the middle of the inner margin, toothed on the submedian fold, and *shaded behind with blackish brown*, with a blackish brown line from the costal origin of the silvery band to the hind margin beneath the middle. Hind wings *dark brown*, yellowish at the base." Clemens. (loc. cit.)

Expanse of wings, 0.60—0.70 inch; *length of body*, 0.30 inch.

Habitat.—New York (Grote). Boston (Sanborn). Illinois, (Kennicott, Clemens). Texas (Belfrage).

Larva.—"Outline elliptical, somewhat pointed behind; body flattened, with the sides curving from a central ridge, flattened above. The ridge has a vertical elevation at its sides, growing less and less before and behind, and terminates in front in a rounded margin, and behind in an obtuse short spine. The body is smooth, with no distinct defined papulæ, but the edges of the ridge and the outline of the body are thrown into folds, subcrenated. The body is thickest in the middle, whence it curves anteriorly and posteriorly. General color of the body is palè green and dotted with numerous yellow points. Central ridge is bordered in front with yellow."

"The *larva* feeds on the underside of the leaf of maple in September, and the *imago* appears in the spring. There is doubtless a spring brood of larvæ." Clemens. (loc. cit.)

The above description of the larva is given by the writer as belonging to the type of his *L. laticlavia*, it being evident that he was unacquainted with the larva of the variety with *blackish bands* on the primaries of the imago. The specimen here figured was received from Mr. Belfrage, of Texas, along with others, all of which show the blackish band on the primaries more or less distinctly, and in this respect correspond more closely with the "VAR." of Dr. Clemens, than with his

type ; but the secondaries are uniform pale as in the type, instead of dark brown as in the "*var.*". These differences do not seem sufficient to warrant the specific separation of these two forms, especially as Mr. Grote states that in *L. rectilinea*, the black shading to the white band is sometimes absent, while in both species it is the white transverse bands which afford the most striking and constant specific characters, and these appear liable to but little variation.

Mr. Belfrage states that the insect is found in Texas, from May to September, and is frequently taken at lights in company with *L. rectilinea*, and other species apparently referable to *Adoneta*.

BOMBYCIDÆ.

COCHLIDIINÆ.

Genus **LIMACODES.** Latreille.

Head moderate, sunk in thorax, not prominent from above, being somewhat concealed by the thorax, thus differing from *Lithacodes* which has the head prominent. Thorax hairy, with its component parts badly defined; in *Lithacodes* the thorax is smooth and patagia distinct. Antennæ long, slender, minutely serrate, basal joint smaller than in *Lithacodes*. Palpi stouter than in *Lithacodes*, porrect, extending beyond front.

Body moderately stout, stouter than in *Lithacodes*, extending to or beyond the hind wings.

Anterior wings moderately long. Costa straight, apex distinct, prominent; outer margin slightly convex; inner angle rounded. Inner margin very full and square at base, making it nearly parallel with costa. The wings are more triangular than in *Lithacodes*, owing to the more unequal length of the sides. Secondaries equal in width to primaries, outer margin rounded, tolerably full, apex subacute, less rounded than in *Lithacodes*. Upper branch of 3rd subcostal in primaries short, making the apical space much shorter than in *Lithacodes*.

Larva onisciform.

1.—LIMACODES SCAPHA. (Pl. 8, fig. 15, ♂.)

Limacodes scapha, Harris, Cat. Ins. Mass. (1833.)
Limacodes scapha, Harris, Ins. Inj. Veg., p. 303. (1841.)
Limacodes undifera, Walker, Cat. Lep. B. M. V., p. 1149. (1855.)
Limacodes scapha, Harris, Ins. Inj. Veg. 3rd. ed. p. 420. (1862.)
Limacodes scapha, Walsh, Proc. Bost. Soc. Nat. Hist. IX., p. 298. (1864.)
Limacodes scapha, Packard, Proc. Ent. Soc. Phil. III. p. 341. (1864.)
Limacodes scapha, Harris, Ent. Corr. p. 300, pl. 3, fig. 8 larva. (1869.)
Limacodes scapha, Packard, Guide. Stu. Ins., p. 290., fig. 219. (1869.)

♂. ♀.—"Light cinnamon brown. Palpi, prothorax, femora and tibiæ and secondaries a little darker. On the primaries the costo-

median region is filled in with a dark tan colored triangular spot, its apex sometimes rounded, terminating a little beyond the submedian nervure. It is continued along the costa to the base of the wing (near which it is deeply excavate), and terminates sharply upon the apex. Externally it is lined with silver. A discoidal dark discoloration. Beneath concolorous with the upper side of the secondaries, a little darker at the apex (with the dark patch of the primaries faintly reproduced). The body is stouter than in the other species, while the head is hardly so prominent. The costa of the primaries, which is straight, becomes a little convex towards the apex, hence the apical interspace is a little broader and shorter than usual. The internal angle is not so well marked as in the other species." Packard, (loc. cit.)

Expanse of wings, 1.10 inches ; *length of body*, 0.50 inch.

Habitat.—Massachusetts (Harris).

Larva.—The following description is from the writings of Dr. Harris, (Ins. Inj. Veg. p. 303). "The most common of these slug-caterpillars, in Massachusetts, live on Walnut trees. They come to their full size in September and October, and then measure five-eighths of an inch in length, and rather more than three-eighths across the middle. The body is thick, and its outline nearly diamond-shaped ; the back is a little hollowed, and the middle of each side rises to an obtuse angle ; it is of a green color, with the elevated edges brown. The boat-like form of this caterpillar induced me to name it *Limacodes scapha.*" Dr. Harris was not acquainted with the imago at the time the above description was written, as the larvæ died before reaching maturity ; but Dr. Packard states that Mr. Shurtleff reared the imago from a larva found under a maple tree. It corresponded with Dr. Harris's description, and "constructed a dense obtusely cylindrical ovate cocoon on the surface of the ground, Oct. 17. It was surrounded by an outer thin envelope, covered with grains of sand. The moth appeared June 15."

2.—LIMACODES BIGUTTATA. (Pl. 8,, fig. 16.)

Limacodes biguttata, Packard, Proc. Ent. Soc. Phil. III., p. 341. (1864.)

♂. ♀.—Head, thorax, abdomen and their appendages soft buff-brown ; thorax rather darker than the abdomen.

Primaries soft brown, crossed by a transverse, oblique, paler, whitish

straight line, from rather within the middle of the inner margin, to a point on the costa two-fifths from the apex. A similar straight whitish line originates on the costa near the apex and runs to about the middle of the outer margin. The apical space outside this latter line is reddish-brown. There is a similarly colored semicircular spot at the anal angle, margined inwardly with whitish. Fringes rather paler than the base of the wing.

Secondaries dark brown, somewhat darker than the primaries. Fringes paler.

Beneath concolorous with secondaries above, immaculate.

Expanse of wings, 1.00 inch; *length of body*, 0.45 inch.

Habitat.—New York (Edwards). Pennsylvania (Harris).

For my specimen of this species I am indebted to my friend, W. H. Edwards, Esq. It was accompanied by the cocoon from which it emerged, but I have not been able to find any description of the larva. The cocoon is brown, tough and smooth, broadly oval, almost spherical, with the sides somewhat flattened, and the whole enveloped in a thin flossy web. The imago escaped through a circular hinge-like lid or cap.

This species is much more thickly scaled than *L. scapha*, and has a softer, more velvety, appearance.

2.—LEUCARCTIA ALBIDA. N. S. (Pl. 8, fig. 22, ♂.)*

♂.—White. Head and thorax white. Sides of the front, next the eyes black. Palpi black, a little whitish below. Thorax beneath white. Antennæ black. Abdomen clear yellow ochre above, except the apical segment and the basal hairs which are white. Beneath white. Each segment above has a transverse black spot. There is a lateral row of small black dots, and a faint indication of a sublateral row of the same color. Legs white above. Coxæ of anterior pair black, fringed with yellow hairs. Inside of femora yellow; those of the middle pair only partially so, those of the posterior pair only at the apex of the joints; tips all touched with black. Tibiæ of anterior and middle pairs streaked with dusky inwardly; posterior pair white. Tarsi dusky beneath.

Wings pure white, both above and beneath; the anterior pair immaculate; secondaries showing faint traces of a discal spot, and two submarginal spots.

Expanse of wings, 1.20 inches; *length of body*, 0.80 *inch*.

Habitat.—Owen's Valley, California, (Coll. Stretch), ♀ unknown.

I am indebted for this specimen to Lieut. Wheeler, of the U. S. Exploring Expedition. The specimen is in poor preservation, but may be readily distinguished from *L. acræa*, not merely by its smaller size and the absence of markings, which alone, in such genera as this, would scarcely warrrant its separation under a specific name, but by the color of the posterior wings, which are totally different from the well known *L. acræa*. It may not be uninteresting to add that I have in my collection a ♂ exactly corresponding to the foregoing description, which I received from Costa Rica, through Dr. Von Patten. This gentleman's collection was made on the table lands of the interior. I have also, from the same locality, a large *notodontid* (?), likewise identical with a specimen received from Arizona! When it is remembered that I am as yet acquainted with only six species of *Bombycina* from the district of Arizona and its vicinity, it is somewhat remarkable that two of these should be represented in a locality so widely removed as Costa Rica, and we may naturally look for many striking additions to our list of insects as we become more familiar with this as yet almost unknown country.

* See page 98 ante.

BOMBYCIDÆ.

ARCTIINÆ.

Genus **HYPHANTRIA.** Harris.

"The structure of the fore and hind wings like those in the genus *Spilosoma*.

"Head moderate, somewhat sunken and woolly; with ocelli. Face tapering and vertical. Eyes moderately large. Antennæ shortly pectinated in the ♂, serrated in the ♀. Labial palpi rather hairy beneath, scarcely extending beyond the clypeus; *second joint very short, and terminal joint nearly rudimental.* Tongue nearly as long as the anterior coxæ, filamentous.

"Structure of fore and hind wings as in the genus *Spilosoma*.

"Body rather stout. Thorax woolly. Patagia not erected, rather broad and flattened. Breast woolly; abdomen rather smooth. Legs with the femora woolly; tibial spur of the fore legs long and curved, hind tibiæ with a pair of small apical spurs."

"Mr. Walker does not recognize this genus, but refers the species Dr. Harris placed in it to *Euproctis* Hübner. The structure of *E. auriflua* does not, however, authorize this step. In it the antennæ are deeply pectinated in ♂; the palpi are differently formed, the tongue more rudimentary; the costal and subcostal veins in the hind wings distinct to the base, although connected in the middle of the cell by an intercostal branch; and in the fore wings the second subcosto marginal nervule arises between the post apical and apical nervulet. The head is without ocelli, and the structure of the legs in *auriflua* differs from that in *Textor*. A consideration of these differences, and the structural agreement of *textor* with other genera of the family *Arctiinæ*, the habits and structure of the larva, can leave no doubt, I think, respecting the true position and naturalness of the genus."

Clemens, Proc. Acad. Nat. Sci. Phil., p. 530. (1860.)

Three species of this genus are found in the United States; two of them (*H. textor*, *H. cunea*,) are well known, while it is doubtful whether the third (*H. punctata*, Fitch,) is specifically distinct from *H. cunea*. They may be distinguished thus:

Wings white - - - . - - - *H. textor*.
Wings spotted
With many spots - - - - - - *H. cunea*.
With single band of small spots - - - *H. punctata*.

1.—**HYPHANTRIA CUNEA.** (Pl. 8, figs. 18, 19, 20, ♂.)

Bombyx cunea, Drury, Ill. Nat. Hist. I. p. 36, pl. 18, fig. 4. (1770.)
Phalæna punctatissima, Smith, N. H. Lep. Ins. Georgia, p. 139, Tab. 77. (1797.)
Cycma cunea, Hübner, Verz. p. 184. (1816.)
Cycma cunea, Hübner, Zutr. Dritt. Hand., p. 8, fig. 405. (1825.)
Spilosoma cunea, Westwood, Ed. Drury, p. 34. (1837.)
Hyphantria punctatissima, Harris, Ins. Inj. Veg., p. 255. (1841.)
Spilosoma cunea, Walker, Cat. Lep. B. M. III., p. 669. (1855.)
Hyphantria cunea, Fitch, 3rd Rep. Ins. N. York, p 384. (1856.)
Hypantria cunea, Clemens, Proc. Acad. Nat. Sci. Phil. p. 531. (1860.)
Hypantria cunea, Morris, Syn. Lep. N. Am. app. p. 343. (1862.)
Hyphantria punctatissima, Harris, Ins. Inj. Veg., 3rd ed., p. 358. (1862.)
Hyphantria cunea, Saunders, Can. Ent., vol. 3, p. 36, larva. (1871.)

♂.—White, with many black spots. Head, thorax and abdomen white, the latter with a faint dorsal series of black dots. Palpi black at tips above. Antennæ white, pectinations of ♂ blackish beneath. Legs white; fore coxæ and femora luteous; tibiæ and tarsi blackish outwardly.

Anterior wings white, with transvere angulated bands of blackish spots, arranged as follows: A sub-basal band, angulated outwardly on the median vein, inside which at the base are several small spots. Band two runs through the origin of the 4th median nervule; from the inner margin to the median vein it is parallel with the outer margin, thence it is sharply angulated to the costa. Band three is near band two, being parallel with it until it reaches the median vein, where it is bent less strongly toward the costa than band two, and therefore diverges from it, passing over the discal vein. Band four is parallel to band three, and is made up of small spots not well defined; then follows a subterminal series of linear dots arranged in pairs on each side of the nervules, and finally a marginal, interspaceal series of black dots. These spots vary greatly, many of them being frequently obsolete, giving the insect quite a different appearance. The bands

most generally present, and which may be considered typical of the species, are the 1st, 3rd and 5th.

Secondaries white, sometimes with a faint discal dot, a series of small marginal dots near the apex, and two faint submarginal dots near the apex and anal angle respectively. Any or all of these spots may be wanting.

Beneath as above, except that the markings are usually somewhat paler.

♀.—White, immaculate.

Expanse of wings, 1.30 inches; *length of body*, 0.55 inch.

Habitat.—Massachusetts, (Harris). New York, (Edwards). Canada, (Saunders).

Larva.—"Length 1.75 inches; cylindrical, head small, bilobed, black and shining, with a faint brownish streak between the lobes, scarcely visible above, and a few short brownish hairs.

"Body black, with a slight shade of brown, and sprinkled all over with very minute whitish dots, scarcely visible without a magnifier. On each segment a transverse row of shining black tubercles, each emitting a tuft of hairs of the same color. On each side, from sixth to twelfth segments inclusive, is a double row of orange-colored spots —those composing the lower row more conspicuous than those in the upper one. There is also a faint continuation of these spots on segments anterior to the sixth, but they are scarcely visible to the unaided eye.

"The under surface is paler, of a blackish brown color; feet black and shining; prolegs brownish, with a wide ring of shining black."

Saunders (loc. cit.)

This species is very similar to *H. textor* in its habits. It is very abundant in New York and extends into the Southern States.

HYPHANTRIA TEXTOR. (Pl. 8, fig. 21, ♂.)

Arctia textor, Harris, Cat. Ins. Mass. (Hitchcock's Rt. p. 591.) (1833.)

Hyphantria textor, Harris, Ins. Inj. Veg., p. 255. (1841.)

Euproctis textor, Walker, Cat. Lep. B. M.

Hyphantria textor, Fitch, 3rd Rep. Ins. New York, p. 382. (1856.)

Hypantria textor, Clemens, Proc. Acad. Nat. Sci. Phil., p. 530. (1860.)
Hypantria textor, Morris, Syn. Lep. N. Am., p. 344. (1862.)
Hyphantria textor, Harris, Ins. Inj. Veg. 3rd ed., p. 358. (1862.)
Spilosoma candida, Walker, Cat. Lep. B. M. XXXI., p. 291. (1864.)
Hyphantria textor, Riley, 3rd Rep. Ins. Missouri, p. 130, fig. 55 *a* larva, *b* pupa, *c* imago. (1871.)
Hyphantria textor, Saunders, Can. Ent., vol. 3, p. 69. (1871.)

♂. ♀.—Wings pure white, immaculate. Head, thorax and abdomen white. Antennæ white, pectinations of the ♂ blackish beneath. Palpi at the tips blackish above. Legs white; fore coxæ and femora luteous; tibiæ and tarsi of the anterior and middle pairs blackish in front; tarsi of hind pair touched with black.

Expanse of wings, 1.30 inches; *length of body*, 0.55 inch.

Habitat.—Massachusetts, (Harris). Maine, (Packard). Missouri, (Riley). Canada, (Saunders).

Larva.—(Riley loc. cit.) "Ground color greenish-yellow. Dorsum velvety black, with a narrow median pale line on thoracic joints. Sides speckled with black, except along subdorsal and stigmatal lines, where longitudinal yellow patches are left clear. Venter dusky or smoky-brown. Head shiny black, with labrum and antennæ white. Thoracic legs black; prolegs long and narrow, smoky black with faint orange extremities. Covered with long straight hairs, longest on joints 2, 3, 11 and 12. These hairs are either dirty white with a few black ones interspersed, or of a more uniform reddish-brown. They spring in bundles from around large warts situated as follows on each joint: 4 which are black and dorsal, arranged in a trapezoid, the anterior pair being the smaller; and 4 which are orange on each side, and arranged in a transverse row in the middle of the joint. Stigmata light yellow. Average length 1.10 inches."

"Varies considerably, in some the black predominating, in others the yellow. Those found on hickories are usually the darkest. When newly hatched it is pale yellow, with two longitudinal rows of black marks and a black head."

This insect is only too well known as the Fall Web-worm. The larva are hatched about the month of July; they live in company under a web.

BOMBYCIDÆ.

COCHLIDIINÆ.

Genus **PARASA.** Moore.

"Head prominent, the front very broad, square. Antennæ shorter than in *Euclea*, pectinated on the basal half, the branches a little longer than in *Euclea*. The palpi are porrect, the subacute tips passing a little beyond the front, but they are not so stout nor so long as in *Euclea*. Thorax stouter than usual, globose, while the abdomen is small, tapering rapidly towards the tip, which is not much tufted. Primaries broad, costa swollen near the base, and towards the apex, being more excavated in the middle than in *Euclea*, while the apex is more produced, and the outer edge is longer and more oblique, more regularly rounded and continuous with the inner edge, which is a little shorter than the outer edge, while in *Euclea* the outer edge is shorter than the inner. The subcostal nervure runs nearer the costal edge than usual, going straight to the origin of its 3rd nervule. The origins of the 1st, 2nd and 3rd subcostal nervules are equidistant. Apical interspace shorter and broader than in *Euclea*. Discal nervules and origin of last subcostal and 1st median are all well placed beyond the middle of the wing. Last subcostal nervule arises opposite the independent or 1st median, where in *Euclea* it is removed much farther inward. The 2nd median nervule arises farther in than the 3rd, and the end of the nervure connecting them is very oblique, while in *Euclea* it is straight and the two nervules arise opposite each other."

"The secondaries reach nearly to the tips as in *Euclea*, but are narrower, and the outer margin is shorter, thus making the interspaces narrower, especially the apical space; and the branches of the median nervure are shorter. * * * The wings and body are finer scaled than in *Euclea* and the veins can be more distinctly seen on either side."

Packard, Proc. Ent. Soc. Phil. vol. 3, p. 339. (1864.)

The above description appeared under the name of *Callochlora* Packard. The colors of the genus are green and brown, the former color predominating on the primaries, whereas the reverse is the case in *Euclea*.

1.—**PARASA CHLORIS.** (Pl. 8, fig. 17, ♂.)

Neæra chloris, H. Sch.

Neæra chloris, Walker, Cat. Lep. B. M. V. p. 1140. (1855.

Limacodes viridus, Reakirt, Proc. Ent. Soc. Phil. vol. 3, p. 251. (1864.)

Callochlora vernata, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 339. (1864.)

Parasa chloris, G. & R. Cat. Lep. N. Am. pt. 1, p. X. (1868.)

Callochlora chloris, Packard, Guide, Stu. Ins. p. 290, fig. 220. (1869.)

♂.—"Fore wings. A dark brown spot at the base extends inwardly to the submedian nervure, follows it for one-fourth its length, then crosses, parallel with the outer margin to the costa, which is also brown. A broad light brown marginal band, traversed by darker nervules, the inner boundary of which is a rich brown-velvety line, darkest towards the inner angle, and also parallel with the margin. The rest of the area is pea-green. Hind wings fawn color, shading into dark brown along the margin. Below greenish yellow on the fore, and pale fawn on the hind wings. Antennæ brown; thorax green; face, abdomen and legs brown."

♀.—Fore wings. A dark brown semi-elliptical broad patch on the costa, curving inwardly a little beyond the median nervure; the remainder of the surface, excepting a brown marginal border, is pea-green. This border widens towards the inner angle, the nervures being distinctly lined with dark brown, and has a dark spot, near its middle, extending along the margin. Hind wings fawn colored. Under surface and body resembling the male." (Reakirt, loc. cit.)

Expanse of wings, ♂ 0.94, ♀ 1.06 inches; *length of body*, 0.45 inch.

Habitat.—Pennsylvania, (Reakirt). New York, (Grote).

Larva.—Of the larva Mr. Reakirt says: "I can describe approximately only, having neglected to fully observe its ornation. It was about three-fourths of an inch long; general color brown. Its body rises very abruptly and broad from the head, which is rounded, thence tapering gradually, until within a short distance of the tail, where it as suddenly descends, terminating in a sharp point. There are three distinct dorsal ridges, each being furnished with clusters and spinules."

"It feeds on the chestnut, and may be found during September. Cocoon, about half an inch long is spun on the midrib of a leaf, oval, shining, brownish-black; the imago appears in May."

9.—ALYPIA LANGTONII. (Pl. 8, fig. 3, ♂.)*

Alyptia Langtonii, Couper.

Alypia octomaculata, (part) Walker, Cat. Lep. B. M. I. 60. (1854.)

♀.—Black and sulphur yellow. Head and front black; sides of front next the eyes and sides of head behind the eyes narrowly yellow. Palpi black, yellow inside, and at the base beneath. Antennæ black, basal half sub-annulate with yellow. Thorax and abdomen black, both above and below. Prothorax black. Patagia sulphur yellow. Legs black, with a few minute white markings on tarsi. Tibiæ of the two anterior pair clothed with orange scales.

Wings dull black with a few metallic blue scales centrally on the superiors. Anterior wings with two unequal sulphur yellow spots. The smaller, longitudinal, oval, subbasal; the larger, transverse, subovate, placed at right angles to the costa across the base of the nervules.

Secondaries with one rounded spot, intermediate in size between the two on the primaries, placed on the discal vein.

Beneath as above, except that the black of the wings is less intense.

Expanse of wings, 1.10 inches; *length of body*, 0.50 inch.

Habitat.—Canada, (Couper). New York, Pennsylvania, (Grote).

Walker considered this species as a variety of *A. octomaculata*, a conclusion in which he can hardly be sustained. Evidently its nearest ally is *A. Sacramenti* of California, which has precisely the same number of spots. The latter is, however, a much larger insect, so far as I can judge from the three examples which I have seen. In the coloration of the body parts it is almost identical, and the most constant and recognizable difference is to be found in the spot on the under surface of the secondaries, which in *A. Langtonii* shows no tendency to the expansion noticeable in *A. Sacramenti*. The habits of the latter species are also peculiar as noted; there seems to be no record of a similar peculiarity with regard to *A. Langtonii*, which would scarcely have escaped notice had it been a prominent character. In my specimen of *A. Sacramenti*, the legs are imperfect, but I note that while the tibæ of the middle pair are orange, they do not have a clothing of long hairs.

*See page 5, ante.

10.—ALYPIA MACULLOCHII. (Pl. 8, fig. 2, ♂.)

Alypia Maccullochii, Kirby, Faun. Bor. Am. IV., 301, pl. 4, fig. 5. (1837.)
Alypia Maccullochii, Walker, Cat. Lep. B. M., pl. I., p. 60. (1854.)
Alypia Maccullochii, Syn. Lep. N. Am., p. 133. (1862.)

♂.—Black, yellow and white. Head black, narrowly margined with yellow behind the eyes. Palpi black. Antennæ black, finely annulate on basal half with white. Prothorax black, with a few yellow hairs. Patagia yellow. Thorax and abdomen black, above and below. Anal claspers very large, black, hairy. Legs black; tips of basal joints of tarsi white; tibiæ of two anterior pairs clothed with orange scales.

Anterior wings deep velvety black, with distinct metallic blue scales on the discal vein, on the basal third of the costal area, and along the submedian vein; on the latter vein they diminish in number outwardly. A wedge shaped pale sulphur yellow spot at base, with the outer angle rounded, and divided longitudinally by the black median vein. A small sub-trapezoidal yellow spot in the discal area; and a transverse band on the median nervules, very pale, almost white, divided into six areas by the black veins; the sixth of these spots, or the one nearest the costa, is very minute, the others subequal. This band is of nearly equal width throughout, and terminates abruptly on the 4th median vein. The costa is strongly swollen and thickened near the middle, forming a groove apparently for the reception of the antennæ, such as we find in many *elateridæ* and *curculionidæ*.

The secondaries are also velvety black, with *clear white* markings. These consist of a basal spot which leaves a wide black margin on the inner border; is clearly divided into two by the black median vein, and again very faintly divided nearer the costa. An outer band across the nervules divided into five spots by the black nervules. The second of these spots is the longest, diminishing to the last, which does not reach the fourth median. The costal area is also whitish.

Beneath, the markings of the primaries are reproduced, but are *white* with only the faintest tinge of yellow on the basal spot which is enlarged so as to reach the inner margin. Secondaries as above, ex-

cept that the costal streak is much more clearly defined, has a pale yellow tinge and reaches the outer edge of the submarginal band. The basal spot is also larger and approaches the inner margin more nearly than above.

Expanse of wings, 1.08 inches; *length of body*, 0.58 inch.

Habitat.—Canada, Nova Scotia, (Kirby). Hudson's Bay, (Walker). California, (Grote). Oregon, (Walsingham).

With the ♀ I am acquainted only through the medium of Kirby's figure, which, judging from the body, evidently belongs to this sex. It differs chiefly in the shorter length of the body. There seems to be considerable confusion or else variation in the colors of this species. Kirby's figure* shows the markings to be yellow, while his description gives them as white. It is just possible that the yellow tint is the effect of age on an inferior kind of white color, which not unfrequently undergoes this change, to the disgust of the artist. Grote, however, (Bull. Buffalo Soc. Nat. Hist. Vol. 1, p. 31,) states that a specimen from Owen's Lake, Nevada, (this lake is in Inyo County, California,) shows a sulphur tinge on all the wings, but most decidedly in the primaries, while in my specimen from Oregon, the markings are all white except the basal spot on the primaries.

The general pattern of ornamentation in *A. maccullochii*, *A. ridingsii*, *A. lorquinii* and *A. Similis* is so similar that it is not very easy to draw the difference in words. The most available character is the outer spot on the primaries. In *Ridingsii* the inner margin of this spot is very irregular in its outline; in *Lorquinii* the spot is nearly linear, attenuated at both ends; in *Maccullochii* it is wider, the sides parallel, and sharply truncated at each end, in this respect resembling *Ridingsii*; while in *Similis* it is broadly oval. These peculiarities will readily separate the species.

Of all the species with which we are yet acquainted, the present has the widest geographical range. Its home appears to be in northern latitudes, and on the high mountain ranges to the southward where altitude takes the place of latitude.

*For this figure I am indebted to the kindness of W. Saunders, Esq.

7.—CTENUCHA WALSINGHAMII.* (Pl. 9, fig. 1, ♂.)

Ctenucha Walsinghamii, H. Edwards, Trans. Cal. Acad. Sci., vol. 5, p. ?. (1873.)

"Size and aspect of *C. multifaria*.

"Head, collar and patagia bright crimson, the latter narrowly edged with black, as in *C. multifaria*, palpi also crimson, with the terminal article black. Antennæ long, blueish black, closely bipectinate. Thorax with the disc greenish black. Abdomen very glossy, blueish black, with a faint greenish tinge. Legs blueish black, with the anterior coxæ distinctly white. Fore tibiæ with a few white scales.

"Primaries blueish black, with a greenish tinge, most vivid toward the base. Costal edge entirely dull black. Fringe white at apices, the remainder black.

"Secondaries, blueish black, with a purple tinge. Fringe white at apices, rest entirely black.

"*Expanse of wings* 1.90 inches; *length of body*, 0.60 inch.

"*Habitat.*—Fort Crook, Oregon, June, 1872. (Coll. H. Edwards.)

"I owe the possession of this beautiful specimen to Lord Walsingham, who found it in the above locality during his recent tour through Southern Oregon, where it appears to be very rare. At first sight, this species may be confounded with *C. multifaria*, but differs in having the costa entirely black, and the apices of the wings only with white fringes." H. Edwards, (loc. cit.)

*See page 23 ante,

ZYGÆNIDÆ.

CASTNIINÆ.

Genus **PSEUDALYPIA.** Edwards.

"Head small, front very long, densely pilose. Clypeus very long, smooth, triangular, notched on each side in front, and when viewed from above concealing the palpi, which are short, pilose, the third joint longest, the whole palpus straight, and shorter than the head. Antennæ *simple*, not thickened as in *alypia*. Eyes small, not prominent. Tongue more than half as long as the body. Thorax pilose, the hairs of patagia especially long. Abdomen short, stout, covered with close glossy pubescence. Abdominal tuft long. Wings short and broad.

Primaries, with apical angle much rounded. The nervules are very thick; neuration similar to *alypia*.

Secondaries ample, very much rounded, especially towards the anal angle. Fringes of both wings very long. Legs long, only slightly pilose, wanting the bunches of hair observable in *alypia;* hind pair with two very nearly equal pairs of spines, terminal pair being very slightly the shorter.

This genus differs from its near ally *alypia*, by the longer tongue, shorter palpi, stouter and more glossy abdomen, simple antennæ, and by the absence of the dense tufts of hair on the fore tibiæ. The system of coloration is also essentially different; as in *alypia* it consist of a series of spots variously arranged, while in the present genus it forms a simple band, crossing the fore wings near the middle."

H. Edwards, Trans. Cal. Acad. Sci. (1873.)

1.—PSEUDALYPIA CROTCHII (Pl. 9, fig. 2, ♀.)

Pseudalypia crotchii, H. Edwards, Trans. Cal. Acad. Sci., vol. 5., p. ?. (1873.)

"Head, thorax, patagia, and abdomen, deep glossy black, with a slight bronze tinge. Collar, base of palpi, and abdominal tuft, golden orange. Antennæ glossy black, with short scales. Palpi, black above,

golden orange beneath. Feet wholly black, with some small white patches arranged in circular form on the hind tarsi.

"Primaries, glossy black, with a greenish metallic tinge. The costa for about three fourths of its length, and a narrow, slightly curved band crossing the wing beyond the middle, cream white. Apical edge of fringe white, the remainder glossy black.

"Secondaries, dull black with a slight brownish hue. Fringe cream white, except towards the anal angle where it is black. Under side similar to the upper, with the band of primaries more broadly defined, and with a whitish tinge toward the base.

"*Expanse of wings*, 0.85 inch; *length of body*, 0.35 inch.

"*Habitat.*—Warner's Ranch, San Diego, Cal., May 8, 1873.
(Coll. H. Edwards).

"This exquisite insect was discovered by my friend, Mr. G. R. Crotch, whose enthusiastic labors have added so much to our knowledge of the insect fauna of California, and to whom I regardfully dedicate the species. It was flying in the heat of the day, alighting frequently on flowers, and manifesting much the same habits as the various species of *alypia*." H. Edwards, (loc. cit.)

8.—**ARCTIA INTERMEDIA.** N. S. (Pl. 9, fig. 3, ♂).

Intermediate between *A. virgo* and *A. achaia*. Head and front very pale reddish cream color, sides of front next the eyes blackish. Palpi and antennæ black. Prothorax concolorous with head, each lobe with a small black dash. Patagia black, edged with dark cream color. Thorax black, with two cream colored stripes. All the pale markings on head and thorax concolorous. Thorax beneath black; legs blackish. Abdomen above reddish orange towards tip, reddish at base, anal segment black; a narrow broken black dorsal stripe increasing in prominence towards the tip. Abdomen yellowish white along lateral line, with lateral row of small black spots; black beneath, with traces of a yellowish ventral stripe.

Primaries deep velvety black; fringes, costal margin narrowly, and inner margin more broadly very pale yellow ochre; the veins all clothed with scales of the same color, and the following concolorous markings. A broadish longitudinal stripe below the median vein, leaving the latter before the origin of the 4th median nervule, and then continuing to outer margin parallel to 4th median and furcate just before reaching the same. A broad transverse band just outside origin of 4th median, increasing in width from the inner margin to the costa, where it expands suddenly and increases the width of the costal margin. A second somewhat narrower band across the base of the median nervules, parallel to outer margin, extending from the costa to the longitudinal band, and showing faintly below the latter close to band one. The usual terminal band, originating on the costa midway between band two and the apex, touches the outer margin and is reflexed towards and connects with band two on the origin of median nervules, being again reflexed and connected with the upper fork of longitudinal band at the outer margin.

Secondaries pale vermillion, somewhat orange along costa and inner margin. A reduced black discal spot, a submarginal row of three large subequal black spots, the apical one being fused to the black apex of the wing; there is also a marginal spot near the apex, but not connected with the apical cloud.

Beneath the markings are reproduced, but all the colors are paler and more diffuse, and the costa of the primaries is more distinctly yellow.

Expanse of wings, 2.10 inches; *length of body*, 0.90 inch.

Habitat.—Texas, (coll. Stretch).

Described from 1 ♂ in good preservation, received from Mr. Belfrage, who speaks of it as one of the rarest Texan Bombycidæ. It has many points of resemblance both to *A. virgo* and *A. achaia*. From the former, which it resembles in size, it may be separated by the relative positions of the transverse bands of the primaries to each other, and by the limitation of the pale scales on the veins to the veins themselves. These do not extend into the disc of the wing as in *A. virgo*, but resemble the ornamentation of *A. achaia* and *A. Saundersii*, as pointed out in the latter case by Wm. Saunders, Esq. From *A. achaia* it is readily distinguished by its much larger size, and the different coloration of the abdomen. *A. intermedia* moreover belongs to that section of the genus in which the thoracic parts are smooth and finely scaled, while *A. achaia* on the other hand is in this respect more allied to *A. virguncula*, which has the thorax and its appendages hairy.

It becomes important to note these differences when speaking of many species of *arctia*, as although they may have a certain "fascies" which enables us to separate them at a glance, yet from the uniformity in the pattern of ornamentation, it is frequently difficult to draw a description in words, which shall certainly enable the student to recognize the species intended. Many of the earlier descriptions were lamentably deficient in detail and have been the cause of much of our erroneous synonymy.

9.—ARCTIA ARIZONIENSIS. N. S. (Pl. 9, fig. 4, ♂)

♂.—Head yellow-ochre; palpi black; antennæ brown; prothorax, patagia, and thorax somewhat hairy, pale whitish yellow; the patagia each with a black dash, and the thorax with a central black line. Abdomen above pale vermillion, terminal segments black; beneath black, with a broad ventral pale yellowish stripe. Legs blackish; coxæ of anterior pair hairy, yellow-ochre.

Anterior wings pale creamy yellow, with the following reduced black spots: two basal streaks; three irregularly shaped angular subcostal spots, one of which is on the discal vein, one outside and one inside of the discal vein; two spots on the outer margin, one apical the other on the second meridian; a submarginal spot between the

third and fourth median nervules; an elongated anal spot and a minute transverse spot on the submedian vein, near the base. The middle subcostal spot is supplemented below the median vein by a very faint transverse streak. Fringes concolorous with wings.

Secondaries dirty white, thinly scaled, rosy along the inner margin; with a small blackish discal spot; a submarginal row of three blackish spots, the anal one small, the apical one extending from the costa to the 1st median nervule. There are also two marginal spots, one near the apex, the other about the middle of the inner margin.

Beneath as above, except that the fore wings are nearly white, and the costa of all the wings is decidedly yellow ochre.

Expanse of wings, 1.60 inches; *length of body* 0.65 inch.

Habitat.—Arizona, (coll. Stretch).

Described from one ♂, for which I am indebted to my friend Mr. W. H. Edwards. The nearest ally of this beautiful species is *A. autholea*, Boisduval, which it much resembles. The number and location of the black markings on the primaries is identical, but they are much reduced in size (pl. 3, figs. 7, 8). The chief point of difference is in the black markings on the secondaries of which there is no trace in *A. autholea* ♂, while it may prove, however, to be merely a variety when we possess longer suites of these insects; it is at present sufficiently distinct to warrant a separate name.

10.—ARCTIA VIRGUNCULA. (Pl. 9, fig. 5, ♂.)

Callimorpha virguncula, Fauna Bor. Am. IV, p. 304, pl. 4, fig. 6. (1837.)

Not *Arctia virguncula*, Walker, Cat. Lep. B. M. III., p. 609. (1855.)

Arctia virguncula, Clemens, Proc. Acad. Nat. Sci. Phil., p. 528. (1860.)

Arctia virguncula, Morris, Syn. Lep. N. Am. Supp. p. 338. (1862.)

Arctia nais, Saunders, Syn. Cau. Arct. p. 8. (1863.)

Not *Arctia virguncula*, Saunders, Syn. Cau. Arct. p. 9. (1863.)

♂.—Black and yellow. Head and front yellow, darkest on occiput; sides of front blackish. Palpi hairy, blackish. Antennæ blackish, pectinations brown. Prothorax yellow, two central black spots. Patagia black, edged with yellow. Thorax yellow, with black central dorsal stripe. All the yellow about these parts inclines to ochreous. Abdomen yellow ochre, darker than thorax, with a broad dorsal macu-

lar stripe, also with a lateral and subventral macular stripe on each side. Thorax beneath hairy, mottled black and yellow. Legs striped black and yellowish.

Anterior wings velvety black, marked with clear ochre yellow, but *without transverse bands.* Costal and inner margin and entire fringes yellow. All veins except discal clothed with yellow scales, the scales on the subcostal and median covering more than the veins. A broad yellow longitudinal stripe below the median vein, furcate at the outer margin. From the origin of the median nervules a similar stripe connects with the upper fork of the longitudinal stripe at the outer margin; from the same point a similar stripe runs along 1st median nervule nearly to the outer margin, and is then reflexed squarely to the costa.

Secondaries deep ochre yellow, fringes paler. The costal and inner margins are largely and irregularly dusky black. The apical spot of the submarginal row is fused with the costal cloud, and the anal spot with the black inner margin, leaving the large cordate middle spot alone isolated in the yellow of the wing. Between this and the anal angle there is a small triangular marginal spot, and a larger one near the apex partially fused with the apical cloud.

Beneath the markings are reproduced but the colors are all paler, and the black on the secondaries is broken up at the base and along the costa into numerous spots.

Expanse of wings, 1.50 inches; *length of body,* 0.65 inch.

Habitat.—Atlantic States and Canada.

Although this species is one of the most strongly marked of the North American *arctians*, having more distinctive points than almost any other, there has been much confusion in its synonymy. It is the only American species except *A. speciosa* in which the veins are clothed with pale scales while the ground color of the primaries is black, which is destitute of transverse bands. *A. speciosa*, Mœschler, judging from the figure, is very closely allied to *A. virguncula*, Kirby, having an ornamentation of the primaries almost identical, but differing on the secondaries, being at the same time a smaller and slenderer insect. May it not be only a dwarfed variety? Both these insects have yellow secondaries as have also *A. persephone*, Grote, and some varieties of *A. achaia*, Boisduval, but both these latter species have transverse bands on the primaries which separates them instantly.

Grote states that the specimen in the British Museum determined as

A. virguncula, Kirby, is in reality the *A. persephone* of that author; and Mr. Packard that *Arctia nais* of Saunders' Synopsis is *A. virguncula*, Kirby, while the *A. virguncula* of the same synopis, is the species allied to *A. virgo* and subsequently separated by Grote under the name of *A. Saundersii*.

I have been unable to find any record of the larval stages of this species.

11.—ARCTIA ANNA. (Plate 9, fig. 6, ♀.)

Arctia anna, Grote, Proc. Ent. Soc. Phil. vol. 2, p. 335, pl. 8, fig. 1, ♀. (1863.)

"Head between the eyes pale yellow, without spot. Disc of the thorax and each tegula black bordered with pale yellow; collar yellowish with two black spots; base of the thorax showing a few reddish colored hairs. Upper and under surface of abdomen immaculate and with under surface of thorax, legs and antennæ, deep brownish black. Palpi black."

"Anterior wings deep velvety black striped with pale yellow. Costa black with a small pale yellow streak at base; subcostal vein to apical third, median vein and its two middle branches and submedian vein narrowly striped with pale yellow. A broader pale yellow band traverses the wing longitudinally from base to external margin, becoming slightly forked at internal angle, and upon which, in the terminal half of the wing, rests a series of pale yellow stripes in the shape of the letter K, with the straight stroke turned towards the base of the wing and the upper limb reflexed, at the apex, towards the costa. In the discal area is a narrow transverse spot, apparently the remains of an obsolete band.* Internal margin rather broadly striped with pale yellow; fringes brownish black.

"Posterior wings brownish black, immaculate; fringes of a more brownish shade. Under surface of the wings dark brown, and showing, on the anterior pair, traces of the broader yellow bands of the upper surface.

Expanse of wings, 1.85 inches.

Habitat.—Pennsylvania, (coll. Phil. Ent. Soc.)

"The blackish, immaculate abdomen and posterior wings separate

*This spot is not noted in Grote's original description.

it from any species of North American *Arctia* known to me; in the disposition of the stripes on the anterior wings it presents most resemblance perhaps to *Arctia virgo*, L." Grote, (loc. cit.)

The type of this species collected by Dr. Samuel Lewis, of Philadelphia, still appears to be unique, and it may yet prove that we are dealing only with a strongly marked aberrant form of some of our well known species, probably *A. Saundersii*. The figure is copied from a beautiful drawing by A. Hochstein, very kindly loaned me by Mr. A. Grote.

12.—ARCTIA YARROWII. N. S. (Pl. 9, fig. 7, ♂.)

♂.—Head clothed with long black hairs. Thorax black, lemon yellow outwardly. Abdomen black, both above and beneath, densely and finely scaled, with an indistinct lateral row of crimson dots. Anal tuft silky, pale ferruginous. Legs black; anterior pair with crimson coxæ; on the middle pair the tips of the tibiæ and the femora are likewise crimson; on the hind pair the tips of the tibæ and ends of the tarsi are also of the same color. (Note; the specimens from which this description is drawn, has been pressed as flat as a botanical specimen, and the body parts do not admit of a more detailed description. The antennæ are wanting.)

Anterior wings velvety black, with very narrow fringes and markings as follows of clear lemon yellow. Five angular costal spots, of which the two nearest the base are quadrate; the third at the middle of the wing is much narrower; all of these extend only to the median vein. The fourth is narrow, though wider than the third, and extends across the wing to the anal angle as an irregular band; being toothed outwardly about the middle, at the point where it receives the termination of the fifth short irregular spot or band. Below the submedian vein near the base of the wing and opposite the costal spots 1 and 2, are two small, very reduced spots; and from the middle of the inner margin springs a very narrow curved band which unites with the middle of the fourth spot, forming with it and the fifth, the usual terminal arctian markings. The disposition of these markings is more like that of *E. caja* or *N. plantaginis* than any of the strictly American arctians.

Posterior wings full, rounded, rather thinly scaled; basal half black, bounded outwardly by an irregular line extending from the basal two-fifths of the costa to the anal angle. Outer half orange-scarlet, in-

ing to orange near the apex. Fringes lemon yellow. This outer half contains a small black spot on the discal vein, and a submarginal row of three larger black spots. The first of these lies across the interspace above the 1st median nervule; the second across the 4th median nervule, and the third on the submedian vein close to the outer margin. There is besides a very narrow marginal spot about the middle of the outer margin.

Beneath, the markings are reproduced, those on the primaries, especially near the apex, being broader and more diffuse; all the light portion of the primaries except near the apex are suffused with crimson, this color being most intense near the base and along the subcostal vein. The secondaries are somewhat paler and there is a crimson streak on the basal third of the costa which does not appear above.

Expanse of wings, 1.75 inches; *length of body*, 0.80 inch.

Habitat.—Arizona. (Coll. R. H. Stretch.) Collected by U. S. Exploring Expedition, under Lieut. Wheeler.

♀ unknown.

This species, without exception the most beautiful of the American Arctians, cannot be mistaken for any other. It belongs to the section in which the veins are not clearly marked with a distinctive color. The body reminds one of *Epicallia virginalis*, Boisd., the under wings suggest the ♀ variety of *Nemeophila plantaginis* with red secondaries, while the ornamentation of the primaries recalls *E. caja*. It is so unlike any of our other species of the genus that further comparison is unnecessary. It is with wuch pleasure that I dedicate this beautiful insect to Dr. Yarrow, who was connected with the U. S. Exploring Expedition in Arizona, and to whom I am indebted for many kindnesses.

13.—ARCTIA QUENSELII. (Pl. 9, fig. 8, ♀.)

Bombyx Quenselii, Paykull. (1793.)
Arctia Quenselii, Geyer, Forts. Hübn. Zutr. Fünft. Hund. p. 14, figs. 847, 848. (1837.)
Arctia Quenselii, Clemens, Proc. Acad. Nat. Sci. Phil., p. 527. (1860.)
Euprepia gelida, Mœsch., Ent. Zeit. Stettin IX, p. 173, 174. (1849.)
Arctia gelida, Walker, Cat. Lep. B. M. III. p. 611. (1855.)

Arctia gelida, Clemens, Proc. Acad. Nat. Sci. Phil. p. 528. (1860.)
Arctia gelida, Morris, Syn. Lep. N. Am., Supp. p. 341. (1862.)

♀.—Head orange, yellow on vertex. Palpi black; antennæ black Prothorax yellow with two large black spots. Patagia black edged with yellow, very narrowly so on the inside. Thorax black, with two broad yellow stripes; abdomen blackish, the segments edged with white along the sides and beneath. Legs black; coxæ of the anterior pair, orange; all the tibiæ whitish outwardly. All the thoracic parts smooth.

Anterior wings velvety black; fringes white. Veins clothed with yellowish scales. A very broad, irregular, sub-basal transverse band, widened on the inner margin to a narrow marginal stripe. The usual longitudinal stripe below the median vein, furcate on the outer margin. A narrow transverse band originates on this longitudinal stripe, and runs across the origin of the 4th median nervule, nearly to the costa. From the same point, a second band runs across the origin of the median nervules, parallel with the outer margin, towards the costa, but terminates on the subcostal vein. The usual terminal band springs from band 2 on the median nervules, the lower fork uniting with the upper branch of the longitudinal stripe, while the other runs towards the apex but is reflexed sharply towards the costa before reaching it.

Secondaries thinly scaled, dark cinereous, fringes white; below the median vein is a broad whitish stripe, breaking into three forks near the outer margin. A second similarly colored stripe, originates at the origin of the median nervules running towards outer margin in two branches. These markings are somewhat badly defined.

Beneath the primaries reproduce the black markings, but the ground color is dirty white, with the basal half of the costa yellowish. The secondaries are largely white, the blackish covering of the upper surface being confined to broken spots along costa and outer margin.

Expanse of wings, 1.35 inches; *length of body*, 0.60 inch.

Habitat.—Labrador, (Mœschler, Strecker). Mt. Washington, New Hampshire, (Sanborn).

A. Quenselii can be mistaken for no other American Arctian. It is abundantly separated by its peculiar grey aud white secondaries. The yellow markings on the primaries are somewhat broken and less regular than in many other species. *A. gelida*, Mœschler, is given as a synonym on the authority of that author himself, my friend, Mr.

Strecker, having shown me a letter from that distinguished entomologist in which he so expresses himself. It is evidently an arctic form, as the specimen from which the figure is drawn though taken in New Hampshire, was found on the top of Mt. Washington.

14.—ARCTIA BLAKEI. (Pl. 9, fig. 9.) ♂.

Arctia Blakei, Grote, Proc. Ent. Soc. Phil. vol. 3, p. 523, pl. 5, fig. 2 ♀. (1864.)

"Head and palpi creamy white; orbits of the eyes black; a black spot on the vertex between the antennæ, which latter are moderate, bi-serrate, blackish, whitish on their outer surface except at extreme tip. Thorax rather deeper creamy white, with two prothoracic and three thoracic black maculations; legs black, marked with whitish; posterior tibiæ and tarsi distinctly striped with whitish on their upper surface. Abdomen creamy white, shaded with yellowish red on its upper surface and at base, with a broad dorsal segmentary series of black maculations, and lateral ones reduced; beneath largely marked with black.

"Anterior wings blackish, bands very pale creamy white. A moderately broad band runs from the base of the wing, below the median vein, longitudinally to internal angle, where it becomes furcate, and upon which, in the terminal half of the wing, rests a series of similar bands resembling the letter K, with the straight stroke turned towards the base of the wing, and the upper limb not attaining the external margin, reflexed very obliquely to costa; a narrow perpendicular stripe runs from the costa across the disc, joining the longitudinal band, and sometimes appearing in the interspace below it; two costal spots, the outer the larger, and from which latter a very narrow stripe runs interruptedly to the longitudinal band and appears below it, broader, distinct, and continued to internal margin. Median and submedian veins at base striped with same color as the bands; internal margin and fringes pale creamy white; costa striped with the same color except for a narrow space before the apex; under surface reflecting the ornamentation of the upper surface with a few yellowish scales at base.

"Posterior wings deep yellow, with a dull red tinge; a series of terminal black spots becoming fused at costal angle, the one at anal angle the largest; discal, costal, subcostal and supra-anal, spots present, black; under surface resembling upper but greatly paler."

Grote, (loc. cit.)

Expanse of wings, ♂ 1.40, ♀ 1.20 inches; *length of body*, ♂ 0.60 inch.

Habitat.—Colorado Territory, Ridings and Mead. (Coll. Ent. Soc. Phil.; Mead, Edwards, Stretch).

For my specimen of this species I am indebted to the kindness of T. L. Mead, Esq., of New York. It is a ♂ and differs chiefly from the above description of the ♀ in the ground color of the hind wings being paler, inclining more to reddish than to yellowish.

15.—ARCTIA ARGE. (Pl. 9, fig. 11 ♂, 10 ♀).

Bombyx arge, Drury, Ill. Nat. Hist. I. p. 35, pl. 18, fig. 2. (1770.)
Phalæna dione, S. Abb., Lep. Ins. Ga. p. 125, pl. 63. (1797.)
Spilosoma arge, Westwood, Ed. Drury. (1837.)
Arctia arge, Harris, Ins. Inj. Veg., p. 244. (1841.)
Arctia dione, Walker, Cat. Lep. B. M. III., p. 605. (1855.)
Arctia arge, Duncan, Nat. Lib. vol. 36, pl. 19. (1858.)
Arctia arge, Clemens, Proc. Acad. Nat. Sci. Phil. p. 528. (1860.)
Arctia dione, Morris, Syn. Lep. N. Am. Supp. p. 340. (1862.)
Arctia arge, Harris, Ins. Inj. Veg., 3rd ed., p. 346. (1862.)
Arctia dione, Saund. Syn. Cau. Arct. p. 7. (1863.)

♂.—White to flesh color, with black markings. The following description is drawn from a flesh colored specimen with the black markings all present.

Head pale creamy pink. Palpi black above, red beneath; side of front black. Antennæ whitish on basal half, remainder black; pectinations brownish. All the thoracic parts pale creamy pink. Each lobe of prothorax, each patagia, and thorax with a central black stripe. Thorax beneath blackish at base of wings. Abdomen pale flesh color above, with dorsal and lateral macular stripes, the spots in the latter small; beneath black, with the edges of the segments flesh color. Legs; anterior and middle pair with red femora, tibiæ whitish outwardly; posterior pair whitish, femora and tibiæ striped with black, tarsi mostly dusky.

Anterior wings creamy pink, fringes concolorous. Costa near apex tinged with vermillion. Marked as follows with black. Two long spots in discal area; one on discal vein; a narrow stripe below the origin of the 4th median vein; a triangular spot below median vein outside ori-

gin of 4th median ; a triangular submarginal spot in the same interspace ; six marginal more or less triangular streaks in the interspaces, two being near the apex, one at the anal angle, and the other three in the interspaces of the median nervules ; of these the longest are the anal spot, and the third from the anal angle. There are also two similar spots near the costa midway between the apex and the spot on the discal vein ; a long streak just above the submedian reaching from the base nearly to the outer margin, and a short basal streak below the same vein.

Secondaries whitish, clothed with pink hairs on the basal portion, with a distinct very narrow vermillion marginal band from the apex nearly to anal angle, and marked as follows with dusky black. Two geminate marginal spots on apical half of outer margin ; a submarginal row of three spots, the first of which lies between the geminate spots, the second and largest on 4th median, the third on the submedian nervule. Also a spot on the discal vein, and some blackish markings on the costa.

Beneath the wings are whitish. On the primaries the spots are reproduced but the discal area is entirely black, while the costa is vermillion, as is also the outer margin very narrowly, and the top of the veins especially towards the apex. Secondaries very much as above only wanting the pink basal hairs.

♀.—Similar to male. This species varies much in the ground color of the wings, being often dirty white and all intermediate gradations to flesh color ; and many of the spots, especially on the secondaries are frequently obsolete, as will be seen in the figure of the ♀. The latter is drawn from a Texan, and that of the ♂ from a New York specimen.

"*Expanse of wings* 1.50 to 2.00 inches ; *length of body*, 0.60 to 0.75 inch.

Habitat.—Atlantic States and Canada, extending south to Texas. California, (?) (Boisduval).

Larva.—The following description is from Harris's Correspondence, p. 286. "Black above and below, with three longitudinal, flesh white stripes on the back. Tubercles gray with radiating black hairs. On each ring, above, four tubercles, two and two, the anterior pair smallest ; below the lateral line three tubercles. Hairs beneath rusty. Prolegs rusty yellow. Fore legs black. Head black. A flesh colored spot on the side of each ring. Upper side of the body greenish gray;

tubercles same color, but surrounded by a large black spot, which gives a general black color to the whole body. The white spots are between the upper rows of lateral tubercles."

The larva from which the above description is drawn, was found in October.

This species is very widely distributed over the United States, ranging from Canada to Texas. Boisduval enumerates it in his list of Californian *Lepidoptera*, but it is very doubtful whether its range entends as far westward as the Rocky Mountains, if so far. I do not find any record of its occurrence in Colorado Territory, and it is yet an unknown species to California entomologists. Several other eastern species are stated by Boisduval to occur in California, which have not occurred here since the date of his earlier writings on the *Lepidoptera* of this coast, although they are among those of most frequent occurrence in the Atlantic States, and I am led to the conclusion that some errors of locality must have crept into his descriptions.

M. J. Akhurst of Brooklyn, N. Y., informs me that he usually finds the imago in open pastures, somewhat bare of vegetation.

16.—ARCTIA SUPERBA. N. S. (Pl. 9, fig. 12).

♂.—Front black, vertex pale cream color, with a black spot on the occiput. Palpi black. Antennæ brown. Thorax hairy, black; patagia pinkish cream color, with a broad black dash in each. Abdomen cream color, darkest above, with a broad black dorsal stripe, and mixed black and pale hairs at base; a double ventral row of black spots, and faint traces of a lateral row of black dots. Breast hairy, black; yellow between anterior coxæ. Legs cream color, marked with black.

Anterior wings rich brown-black, with cream colored markings and fringes. A narrow longitudinal streak, furcate at outer margin; an oblique sub-basal band, not seen below the longitudinal streak; a broader median transverse band, wide to the longitudinal streak, narrower below and curving toward base. A spot on the costa between these bands. A second, outer, sinuate, narrower band, very approximate to the median band on the longitudinal streak, but not united to it, and appearing only very faintly below the longitudinal streak. The usual arctian terminal band is very narrow, its outer angles not touch-

ing the outer margin. Costa very narrowly cream color nearly to the apex; inner margin the same nearly to anal angle.

Secondaries pale clear red, fading to yellow on the costa, fringes pale. A broad, black, outer marginal band, with sinuate inner margin, terminating abruptly before reaching the anal angle, and produced slightly along the costa at the apex. A small black, reniform discal spot, a fainter costal spot at basal third, and a black streak on submedian vein, extending from the base nearly to the marginal band.

Beneath as above, but paler, especially the secondaries, which are reddest along the inner margin.

Expanse of wings, 1.25 inches; *length of body*, 0.55 inch.

Habitat.—Vancouver Island, (coll. H. Edwards).

Described from one ♂. This beautiful species is most nearly related to *A. Blakei*, Grote; in the markings of the primaries there is great similarity, but it is clearly separated by the color and markings of the hind wings.

Genus **PLATYCERURA.** Packard.

"Head large and prominent, twice as large as in *Cerura;* front scutellate, broad between the antennæ, while the sides are more parallel than in *Cerura.* Scales short and fine. Palpi short, a little depressed, not reaching the front, compressed and slender; the 3rd joint short, obtuse. Antennæ longer than in *Cerura,* very narrowly pectinated; joints longest in the middle, but slowly decreasing in length towards the tip, which is almost simple. Thorax stouter than usual, no "collar" or transverse lines.

"Primaries short broad triangular, half as broad as long. Costa straight, curved down more than usual at the obtuse apex; outer edge short and not so full as usual; inner angle much more rectangular than usual, while the inner edge of the wing is very nearly straight, though not much longer than the outer edge.

"The 1st subcostal is placed much within the middle of the wing. There is an intercostal space. 2nd subcostal arises just within the origin of the 3rd subcostal. The apical interspace is of the size of that in *Cerura,* while it is, owing to the curved nervules enclosing it, semi-ovate and not triangular as in *Cerura.* The 4th and 5th subcostals are short and straight: The 1st median nervule instead of being an independent as in *Cerura,* is curved downwards at the base, and united with its main nervure, and the 4th median is straight.

"Secondaries short and rounded, apex very obtuse. They reach to the outer fourth of the abdomen. Thus it is much shorter and broader than in *Cerura.* The apical interspace is long, much as usual.

"The abdomen tapers rapidly, contracting rapidly before the tip which is well tufted. Legs much as in *Cerura.*

"The broad triangular fore wings, orbicular secondaries and large broad closely cropped front, the short acute abdomen, and long pectinated antennæ, distinguish this genus from *Harpyia* of Europe, which it somewhat approaches."

Packard, Proc. Ent. Soc. Phil. III. p. 373. (1864.

PLATYCERURA FURCILLA. (Pl. 9, fig. 15, ♀).

Platycerura furcilla, Packard, Proc. Ent. Soc. Phil. vol. 3, p. 374. (1864.)

"♂.—Ashen white, dusted with fine dark scales. The primaries are crossed by a twice angulated basal black line, within which at the insertion of the wing is a short basal spot. A second straight line crosses the wing just before its middle, and from its branches at nearly right angles a line which becomes straight above the 2nd median nervule and parallel to the inner line, thus enclosing a large square area which is concolorous with the rest of the wing. There is a submarginal obscure line shaded with white externally, which is irregularly zigzag, and runs down more than usual in the 2nd median interspace towards the margin of the wing.

"Secondaries whitish, especially on the outer border, with a broad obscure dusky submarginal line. The abdominal segments are annulated above with white, paler beneath. The fore wings are beneath dusky, the transverse dark lines appear through, the submarginal line being especially conspicuous, beyond which the margin is much paler. The secondaries are crossed by two obsolete bands, near the middle of which the inner one is more distinct upon the costa, corresponding to an inner costal spot.

Expanse of wings, 1.50 inches; *length of body*, 0.65 inch.

Habitat.—Massachusetts, (coll. Harris, Mr. Sanborn).

Packard, (loc. cit.)

The figure is copied from a beautiful drawing by Hochstein kindly loaned me by A. Grote, Esq.

I have also two Californian specimens which appear to differ only in the want of union of the two principal bands below the median vein.

ADDENDA ET CORRIGENDA.

ADDENDA ET CORRIGENDA.

ALYPIA OCTOMACULATA. (Page 6.)

On plate 10, fig. 11 is reproduced from a drawing by C. V. Riley, Esq., the larva of this species for comparison. I here give a few notes on the larvæ of this species and its allies, kindly sent me by Mr. Riley, to more clearly point out their differences.

"*Alypia octomaculata.* Your description is correct. Each joint may be said to be 8-banded, or to have eight black bands; and not six as Harris's words would indicate. The species is not abundant round St. Louis.

"*Eudryas grata.* I have nothing to add to what you have said, except to lay stress on the fact that it is distinguished from *Alypia* by having only six black bands to each joint, and no white lateral stripe. It is two-brooded. There are short hairs from the black spots, though it would not be amiss to describe it as "naked." A *Tachina* fly (near to, if not identical with *Exorista leucaniæ*) is parasitic upon it. The moth simulates a piece of bird dung when at rest.

"*Eudryas unio.* Larva marked as Fitch says; at least I so infer from the fact that J. A. Lintner, of Albany, N. Y., wrote me that he had found larvæ of *Grata* abundantly on *Epilobium coloratum*, which larvæ turned out to be *Unio*. The finding of the larvæ or pupæ in stems of Swamp Rose-mallow (*Hibiscus militaris*), does not imply that the former inhabited the stems; for both the *Gratas* and *Psychomorpha* appear to have an inveterate habit of boring into substances to pupate, a habit not noticed in *Alypia*.

"*Psychomorpha epimenis.* Differs from *Alypia* and *Eudryas* in having but four transverse black bands to each joint.

"In *Eudryas* the ground color is really blueish; in *Alypia* and *Psychomorpha* it is white, the blueish appearance is an ocular delusion."

ALYPIA LUNATA. (Page 15.)

Having recently had an opportunity of examining the type of Grote's *A. Mariposa* in the collection of the Central Park, New York, it forming a part of the collection of the late Coleman Robinson, Esq., I am of the opinion that *A. lunata* must be placed as a variety of *A. Mariposa*. In this opinion I am confirmed by the circumstance that my typical specimen was obtained from Mr. Lorquin; and as it has been evidently captured many years since, it is more than probable that it was taken at the same time and in the same locality as the specimens which Mr. Lorquin's father forwarded to Dr. Boisduval, who furnished Mr. Grote with the specimen from which his figure was drawn, and to which reference is made above. The most striking difference is in the spot on the apical half of the primaries. The synonymy of this species will thus be:

Alypia mariposa, Grote, Trans. Am. Ent. Soc. vol. 1, pl. 6, fig. 40. (1868.)

Agarista mariposa, Boisduval, Bull. Ent. Soc. Belgique,

Var. *Alypia lunata*, Stretch, Z. and B. N. Am. vol. 1, p. 15, pl. 1, fig. 6. (1872.)

PSYCHOMORPHA EPIMENIS. (Page 17.)

The following description of the larva, and notes on its habits, are extracted from the 1st, 2nd, and 3d Reports of the State Entomologist of Missouri (C. V. Riley). The larva is figured in 1st Report, pl. 1, fig. 19, and also in 3d Report, p. 63, fig. 25, *a*, *b*, and *c*. The former figure is erroneously referred to in the text as the larva of *Alypia octomaculata*, which error is corrected in the second Report, p. 84. In this place, the larva is conjectured to be and figured as that of *Eudryas unio*, but this supposition proved likewise to be incorrect. The question was finally determined by raising the imago from these larvæ. The near relationship of *Eudryas*, *Psychomorpha*, and *Alypia* is proved by nothing more conclusively than by the wonderful similarity of their

larvæ. To show the relationship of these genera to *Agarista*, from Australia, the larva of *A. Casuerinæ* is figured in pl. 10, fig. 11.

"*Larva*. General appearance bluish. The ground color is, however, pure white, and the apparent bluish cast is entirely owing to the ocular delusion produced by the white with the transverse black stripes, as in *Alypia octomaculata*. Transversely banded with four black stripes to each joint, the third and fourth being usually rather wider apart than the other two, and diverging at the lower sides, where they make room for two more or less conspicuous dark spots, placed one below the other; the third, on some of the middle joints, is frequently broken with an anterior curve, just above stigmata, and on joints 2 and 3 it is twice as thick as the rest. Cervical shield; hump on joint 11; anal plate; legs and venter dull pale orange; joint 1 with about 14 large shiny piliferous black spots, 8 of which form two rows on the cervical shield (those on the anterior row being largest and farthest apart), and six of which are lateral, namely, three on each side, with more or less distinct dusky marks between and in front of them. The spots on the hump are usually placed as at fig. 26 *c*, (pl. 10, fig. 12 a), but vary very much, though the four principal ones on the top are generally placed in a square. The anal plate is marked with eight such spots, very much as in the cervical shield, but smaller. The tips of the thoracic legs are black, and the other legs and venter are also spotted. Head, gamboge-yellow, inclining to orange, with 8 principal and other minor black piliferous spots. The ordinary piliferous spots are small, and except two dorsal ones, which are in the white space between the second and third band, they are not easily detected. The stigmata are also quite small and round. The abdominal prolegs decrease in size from the last to the first pair, and the larva curves the thoracic joints, and is a half looper, especially when young. Average length, about one inch. Described from numerous specimens."

"*Chrysalis*. Average length, 0.37 inch; reddish brown; rugose, especially on dorsum of abdominal joints, but distinguished principally by the truncated apex, which has a large horizontally compressed ear-like horny projection, at each upper and outer edge."

Riley, 3d Rep. St. Ent. Missouri, p. 65.

The larva, as noticed by Riley, is abundant round St. Louis, feeding on the grapevines. "The worm works, for the most part, in the terminal buds of the vine, drawing the leaves together by a weak silken thread, and cankering them. It forms a simple earthen cocoon, or

frequently bores into a piece of old wood, and changes to chrysalis." "Its habit of boring into some substances, to prepare for the change to pupa, is inveterate, and it always neatly covers up the orifice, so that it is difficult to detect." The larva assumes the pupa state in May, emerging in March of the following year.

CTENUCHA BRUNNEA. (Page 30.)

After name insert "(Pl. 1, fig. 11, ♂)"

GNOPHŒLA HOPFFERI. (Page 38.)

Lord Walshingham raised this species from larva found in southern Oregon, feeding on *Myosotis*, and informs me that it is black and yellow, much resembling that of *Callimorpha dominula*.

UTETHEISA BELLA. (Page 55).

Professor Townsend Glover has the following notes on the larva of this species, in the Report of the Commissioner of Agriculture, for 1870, p. 80, fig. 41.

"The larva is abundant in July and August, in the pods of the rattle weed (*Crotelaria*). It eats into the pod when young, making a small circular hole, and then feeds on the seeds. It is yellow, with black and white rings, thus resembling the imago in color, and the chrysalis is black and yellow. The moth is disclosed soon after assuming the pupa state. The larva is also said to feed on the lupin."

CALLIMORPHA LECONTEI. (See Page 62.)

On account of the wide range of variation in this species, I give here below detailed descriptions and figures of two of the varieties, which are only casually alluded to in the former article. For the loan of the specimens from which these figures are drawn, I am indebted to the kindness of my friend Wm. Saunders, of London, Canada. The opinion is strongly held by some entomologists that some of these varieties should be classed as specifically distinct. In relation to this point, Mr. Saunders writes me as follows: "The two forms of Callimorpha, *Lecontei* and *Contigua*, appear to be quite fixed with us. I have never found them run into each other, and I think I should had

they been identical, as I have captured and seen a considerable number of specimens within the past ten years. My four bred specimens were almost identical (referring to *Lecontei*) in coloration with that I send you." While this is, to a certain extent, presumptive evidence, it does not absolutely settle the question, for in the case of *Epicallia virginalis* (see pl. 3) there are two forms (fig. 2 and 4) which appear to be constant, and yet are produced from the same brood of larvæ. As then we can derive these various forms of *Callimorpha Lecontei* from each other, by the expansion or contraction of the brown markings, I retain these different forms as varieties, until the accumulation of more material, being somewhat confirmed in this course by having seen, while in the Eastern States recently, a specimen in every way answering to the *C. fulvicosta*, Packard, except that the costa was brown, as in *C. contigua*, Walker.

Var. *C. Lecontei*, Boisduval (Pl. 9, fig. 14).

Brown and white. Head and prothorax bright yellow-ochre, immaculate. Palpi yellow, with black tips. Antennæ black. Thorax and patagia white, the former with a brown median stripe. Abdomen whitish, with brown dorsal stripe. Breast yellowish. Legs yellow and dusky.

Anterior wings clear dark brown, with white markings, as follows: A broad basal longitudinal streak, narrowing rapidly as it approaches the anal angle, where the tip is nearly separated into a distinct spot. Three sub-costal spots between this streak and the apex, the middle one of which is the largest, and is slightly connected with the apical one. A large anal spot, supplemented towards the apex of the wing with two small intervenular spots.

Posterior wings immaculate milky white.

Beneath, the brown markings are reproduced, but all are suffused with ochre, especially along the outer margin and costa, while the brown on the inner margin is exceedingly faint.

Expanse of wings, 1.80 inches; *length of body*, 0.70 inch.

Habitat.—Canada (W. Saunders), New York (Akhurst).

Described from a specimen raised from the larva by Wm. Saunders, Esq. This larva is described on page 64, ante.

Var. *C. Contigua*, Walker. Head and body like *C. Lecontei*, just described. Legs white, except coxæ of the anterior pair, which are yellow.

All wings white, posterior wings immaculate. Primaries marked as follows, with dark blackish brown, more intense than in *C. Lecontei* or *C. Militaris*. A costal stripe, not quite reaching the apex, and leaving the costa very narrowly white. A similar stripe on the internal margin, not quite reaching the anal angle. An oblique transverse band, connecting this stripe at the anal angle with the costal stripe across the discal vein ; and from the centre of this band a branch runs towards the apex, but does not quite reach it. Fringe on the outer margin, somewhat dusky, and two small marginal brown dots about the middle of the outer margin.

Beneath white ; the costa yellowish. The transverse band reappears, but more diffuse and broken. The other markings are nearly obsolete.

Expanse of wings, 1.80 inches ; *length of body*, 0.70 inch.

Habitat.—Canada (W. Saunders).

Described from a specimen kindly loaned by W. Saunders, Esq.

EPICALLIA VIRGINALIS. (Page 70.)

Since the publication of Part 3, in which this species was figured, I have received two specimens from Arizona, almost identical, and intermediate, so far as the coloration of the secondaries is concerned, between var. *guttata* (fig. 3) and the type (fig. 4). The spots on the primaries are somewhat larger, giving the insect a paler look. My friend, H. Edwards also informs me that the species, both the typical form and var. *guttata*, are common at Portland, Oregon, flying together in the streets of the town.

ARCTIA BEHRII. (Page 75.)

Having recently seen one of the types of *Arctia Nevadensis*, Grote, in the collection of J. Akhurst, of Brooklyn, New York, and ascertained its identity with this species, the synonomy must stand thus :

Arctia Nevadensis, Grote, Proc. Ent. Soc. Phil. vol. 6, p. 1, pl. 1, fig. 1 :

Arctia Behrii, Stretch, Z. and B. N. Am. p. 75. (1872.)

The figure given by Grote does not represent a typical form, and the specimens having been collected in alcohol (!) the color had been somewhat discharged, so that the description varies somewhat from the coloration of fresh specimens. It was from these causes that I failed to identify the insect, though I compared them and noted the peculiar identity in the color of the thorax, which is black and concolorous.

EUPREPIA AMERICANA. (Page 95.)

This name must give place to *Euprepia caja*, the burden of proof being conclusive as to the identity of the European and American insects. The white collar, which appears to occur in all American specimens, and which was mainly relied upon by Harris and subsequent writers, as the most available point of distinction, occurs, more or less strongly marked, in many European specimens, as has been proved to me by Dr. Standinger, of Dresden, and Mr. Strecker, of Reading. To the former entomologist I am indebted for a very beautiful suite of the variations of this insect. It has often been urged that American insects, merely on account of their wide geographical separation from Europe, must be different from their near representatives in that country. Of the fallacy of this view I am more and more strongly convinced, especially as regards those forms which are found in the more northern regions of both continents. Of this, *E. caja* may be taken as one instance, and *Arctia Quenselii* as another, while it is impossible to draw a definite line between *Phragmatobia rubricosa*, Harris, and the European form of *P. fuliginosa*, which occurs in Lapland, and is known as var. *borealis*. We know that many noctuæ occur in both countries, as *Scoliopteryx libatrix*, and why not also species of Bombycina. The Zygænina are less likely to occur in both countries, because they do not range into arctic regions. This view is strongly supported by the marked similarity between the entomological fauna of the northern Pacific Coast of America and that of Europe, which we might naturally expect to occur on account of the intimate connection of the two continents in the Arctic Zone. This is much more decided than on the Atlantic border; and it is reasonable to suppose that these forms, which are alike in both continents, have been disseminated through this medium. Unfortunately, we know but little comparatively of British Columbia, Washington Territory, and Oregon, and it will be of much interest to watch the progress of discoveries in those countries, as bearing on this question. I hope at some day to enter into this question more fully than is permissible in these pages.

LEUCARCTIA ACRÆA. (Page 99.)

Through an oversight, all the plates in Part 4 have the lower wings of the female of this species (pl. 4, fig. 2) colored as in the male; they should be white.

STHENOPIS BEHRENSII. (Page 105.)

Through an oversight, the name of this species is erroneously spelled "Behrnsii." It is named after my friend Mr. James Behrens, who has greatly facilitated my studies by the gift of many unique specimens.

DREPANA SICULIFER. (Page 110.)

Insert before the description the following reference to the original description, which was unintentionally omitted.

Drepana Siculifer, Packard, Rep. Peabody Acad. Sci. (1872).

GASTROPACHA MILDEI. (Page 113.)

The name *G. roseata*, on the explanation of Plate 4, should be changed to correspond with the letter press on page 113. The name *mildei* was substituted for *roseata* at the request of Mr. Behrens, who gave me the unique specimen from which the description is drawn.

NOTODONTA CALIFORNICA. (Page 116.)

On plate 10, fig. 9 is a reproduction of a sketch of the larva of this species made by Dr. Behr, of San Francisco.

LEPTARCTIA LENA. (Page 120.)

Walker's *Nemeophila Californiæ*, is evidently the same insect as the above, a fact which was not discovered, although suspected, until it was too late to correct the synonymy, which must thus stand as follows:

LEPTARCTIA CALIFORNIÆ.

Nemeophila Californiæ, Walker, Cat. Lep. B. M. p. 625 (1855).
Lithosia Lena, Boisd. Ann. Soc. Ent. Belg. vol. 12, p. 73 (1868-9).
Lithosia Adnata, Boisd. Ann. Soc. Ent. Belg. vol. 12, p. 73 (1868-9).
Leptarctia Lena, Stretch, Z. and B. N. Am. vol. 1, p. 120, pl. 5, figs. 3, 4, 5, 6, 11, 12, 13, 14, 16 (1872).

ŒTA AUREA. (Page 159.)

In relation to this species, my friend C. V. Riley writes me as follows: "I greatly suspect it will have to be referred back still further

(alluding to the name *aurea*), for specimens which I sent to Zeller, some years ago, elicited from him the facts that if *compta* varies so that the first two (basal) orange bands are at times separated each into two (and they are sometimes so separated), then it agrees with Cramer's (*Hyponomenta*) *punctella*, pl. 372; whereas, *Pustulella Fabricius* (Ent. Syst., 292) is so described that it covers both."

Mr. Grote, however, writing on the same subject, doubts the identity of these descriptions with our American insect, for reasons stated, and under these circumstances I merely call attention to the fact without changing the synonomy.

Professor Riley, as quoted above, gives some interesting details in relation to the habits of this species. The following quotations are from that article. After stating that the larva feeds on the ailanthus, and had done great damage to the trees in St. Louis, he continues: "During the months of August and September, it may be found of all sizes, living in communities of from five to thirty individuals, within a slight silken web. Did they but feed on the leaves, their injury to the trees would be slight, but they have the miserable habit of gnawing the leaf stalk in two, and of severing the leaf, and causing it to turn black; thus marring the looks of large trees and killing many seedlings outright. When the worm is full grown, it suspends itself in the middle of a loose web, and changes to a chrysalis, about half an inch long, and of a dull smoky brown color. The chrysalis skin is so very fine, that as the future moth develops within, the colors of its wings show distinctly through it. * * The first moths begin to appear during the first days of September, and continue issuing from the chrysalis till the last of October. From the fact that I could get none of them to deposit eggs, I infer that they pass the winter in the moth state—the more readily since I have had them escape from the chrysalis even in November. They are very fond of flitting over and clinging to the flowers of the golden rod and of *Eupatorium serotinum*."

Mr. Riley writes that he has since proved the hybernation of the imago, as suspected.

"*Larva*.—Average length, when full grown, 0.95. Slender, the diameter being 0.09. General color, very dark olive brown. An extremely fine pearly-white dorsal and subdorsal line, and a somewhat more distinct stigmatal line, of the same color; all three of them formed by minute white specks and lines. Dorsum, dull olive green.

A longitudinal line somewhat darker, and in many cases quite black, below the subdorsal line. Between this last and stigmatal line is a stripe of the same color as dorsum, but speckled with white. Immediately below stigmatal line, it is rusty-yellow, especially on the middle segments. Venter sometimes olive green, sometimes lead color, finely speckled with white, and with a translucent line visible along the middle. The larva is mainly characterized, however, by a number of minute white piliferous spots, in strong contrast with the dark body, each giving forth a stiff white hair at right angles from said body. The spots are thus arranged on each side of every segment : two about the middle, on subdorsal line ; one under the anterior of these, just below the longitudinal dark line ; two on the stigmatal line, with the stigmata, which is of the same color, between them ; one in the orange part, posteriorly ; two small ones just below the orange part ; and two in the middle of venter, on the legless segments. Head of a beautiful brown, perpendicular, marked with black and speckled with white, two large spots being especially noticeable on the upper front. Cervical shield, velvety black irregularly speckled with white. Thoracic legs black ; abdominal, extremely small and of the same color as venter ; anals, somewhat larger and brown.

"Described from numerous specimens. The white spots are usually larger near the head, while the hairs springing from them lean towards the head. The head itself is sometimes entirely black, while the white longitudinal lines are occasionally almost obsolete."

Riley (loc. cit.)

From the foregoing it will be seen that the insect under consideration has many affinities with the *Tineina*, and it is quite likely that Riley is right in so locating it.

CYDOSIA NOBILITELLA. (Page 162.)

Mr. Grote informs me that I am correct in doubting the identity of the Texan specimens (pl. 7, fig. 8) with *Cydosia nobilitella*. The name must therefore be changed to *Cydosia imitella*, *N. S.*, as suggested on page 163.

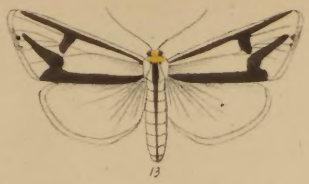
EXPLANATION OF PLATE VIII.

1.—Harrisina texana, N. S, - - - Texas.
2.—Alypia Maccullochii, Kirby, ♂, - Oregon
3.— " Langtonii, Couper, ♂. - - Canada.
4.—Euchætes egle, Harris, ♀, - Atlantic States.
5.— " collaris, Fitch, ♂, - - United States.
6.— " elegans, N. S., ♂, - California.
7.— " oregoniensis, N. S., - - Oregon.
8.—Antarctia vagans, Boisduval, ♂. - California.
9.— " " " ♂, - - "
10.— " " " ♂, - "
11.— " " " ♀, - - "
12.— " " " ♀, - "
13.—Lithacodes rectilinea, G. & R., - - East. & South. States
14.— " fasciola, Packard, - "
15.—Limacodes scapha, Harris, ♂, - - Eastern States.
16.— " biguttata, Packard, ♂, - "
17.—Parasa chloris, G. & R., - - Atlantic States.
18.—Hyphantria cunea, ♂, Fitch, - Eastern States.
19.— " " ♂, " - - "
20.— " " ♂, " - "
21.— " textor, ♂, Harris, - - "
22.—Leucarctia albida, ♂, N. S. - California.


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EXPLANATION OF PLATE IX.

1.—Ctenucha Walsinghamii, Edwards, - - Oregon.
2.—Pseudalypia Crotchii, Edwards, - California.
3.—Arctia intermedia, N. S. - - - Texas.
4.— " Arizoniensis, N. S. - - Arizona.
5.— " Virguncula, Kirby, - - - Atlantic States.
6.— " Anna, Grote, - - - Pennsylvania.
7.— " Yarrowii, N. S. - - - - Arizona.
8.— " Quenselii, Pay-Kull, - - Labrador.
9.— " Blakei, Grote, - - - - Colorado.
10.— " Arge, ♀, Drury, - - Eastern States.
11.— " " ♂, " - - - "
12.— " Superba, N. S. - - - Vancouver Island
13.—C. Lecontei, var. Contigua, Walker, - - Atlantic States.
14.— " Boisduval's type, - "
15.—Platycerura furcilla, Packard, - - "



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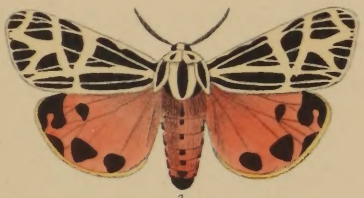
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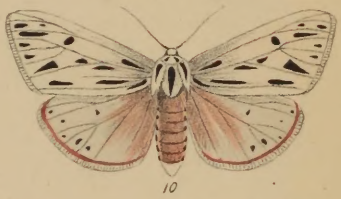
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EXPLANATION OF PLATE X.

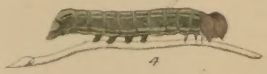
1.—Epicallia Virginalis, Boisd. larva.
2.—Halesidota Edwardsii, Packard, larva.
3.—Arachnis Picta, Parkard, larva.
4.—Phryganidia Californica, Packard, larva.
5.— " " " pupa.
6.—Leucarctia Acræa, Packard. larva.
7.—Halesidota Agassizii, Packard, larva.
8.—Harrisina Americana, larva.
9.—Notodonta Californica, larva.
10.—Alypia Octomaculata, larva.
11.—Agarista Casuerinæ, larva.
12.—Psychomorpha Epimenis, larva.


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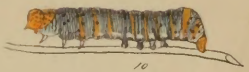

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